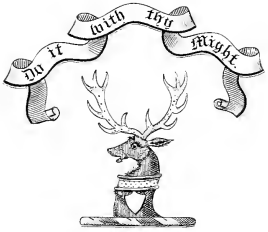
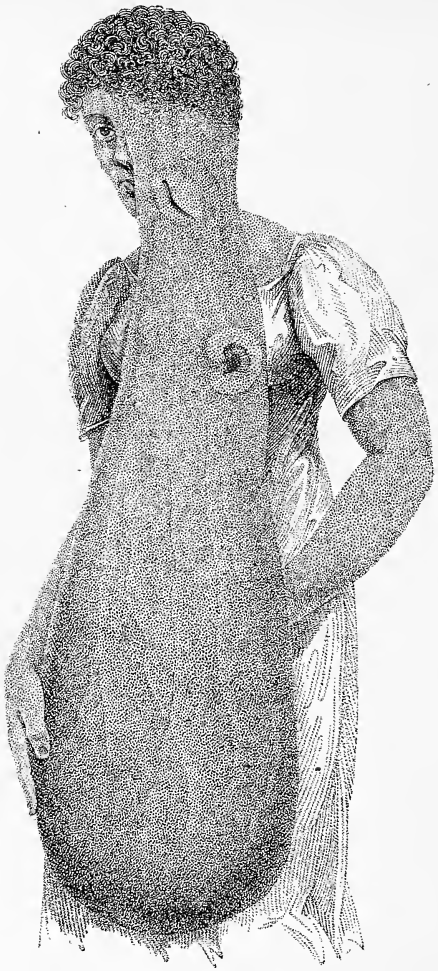


Bertram H. Buxton.



Representation of a Tumor Growing nearly the full Length of the Body.—(*From the Medical Repository.*)

LECTURES ON TUMORS

BY

JOHN B. HAMILTON, M.D., LL.D.

PROFESSOR OF SURGERY, RUSH MEDICAL COLLEGE AND CHICAGO POLYCLINIC; SURGEON TO PRESBYTERIAN HOSPITAL; CONSULTING SURGEON TO ST. JOSEPH'S HOSPITAL, ETC., ETC., ETC.

THIRD EDITION

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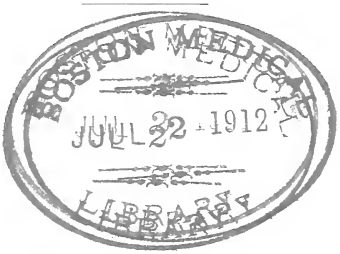

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DEDICATION

This Book is Respectfully Dedicated

TO THE

STUDENTS OF THE MEDICAL DEPARTMENT

OF

GEORGETOWN UNIVERSITY

TO WHOM THE LECTURES WERE ORIGINALLY DELIVERED

AND TO THE

STUDENTS OF RUSH MEDICAL COLLEGE

TO WHOM I HAVE SUBSEQUENTLY REPEATED THEM WITH SUCH CHANGES AS THE LAPSE OF TIME HAS MADE NECESSARY

PREFACE TO THE THIRD EDITION.

During the six and a half years that have elapsed since the publication of the last edition of this book many changes have taken place and very much of the text has had to be rewritten.

The last decennial revision of the nomenclature of the Royal College of Physicians took out of the list of tumors all the class due to infective organisms (the granulomata) and confined it strictly to the neoplasms and cysts.

As that nomenclature was long since adopted in this country by the American Medical Association, it has been strictly followed. This necessitated entire rearrangement. Some new illustrations have been added. Since the appearance of the first edition many larger works have appeared, some of them essentially, and, in fact, works on operative surgery, but this will, as formerly, be limited in scope, so as to serve as a recitation book on the pathology and clinical history of tumors. For convenience the original lecture form has been continued.

The new illustrations have been made from drawings of specimens in the college laboratory.

The author hopes that students will find it as useful to them in their recitations as heretofore.

JOHN B. HAMILTON.

RUSH MEDICAL COLLEGE, CHICAGO, ILL.,
July, 1898.

PREFACE TO THE SECOND EDITION.

The fact that a new edition of this book has been called for so soon after its first appearance is a gratifying evidence that it was needed, and that it measurably met the wants of those for whom it was intended. It made no pretense of being exhaustive; it simply dealt with the elementary principles of the subject, and was intended for students. Extended references to more elaborate works, it was thought, would detract from its simplicity by overloading, and thus tend to create confusion in the minds of beginners in the study.

The author sincerely thanks the reviewers of the Medical Press, who gave the first edition such a very cordial reception, and were

> "To its virtues very kind
> And to its faults a little blind,"

and he sincerely hopes that they will find the second edition an improvement on its predecessor. He also thanks the publisher for the promptness with which the work was published after the manuscript was placed in his hands.

JOHN B. HAMILTON.

UNITED STATES MARINE HOSPITAL, CHICAGO,
December 31, 1891.

PREFACE TO THE FIRST EDITION.

I have been repeatedly asked by my students to recommend a book on Tumors, in English, which would give them, in condensed form, a practical acquaintance with the subject. I was obliged to say I knew of no single treatise which brought together the varieties of tumors set forth in our present nomenclature, and gave the symptomatology and treatment.

I therefore had a stenographer take the lectures as they were delivered, and, as the colloquial form has thus been preserved, it is thought to bring a little relief to the hard-and-fast lines in which articles on tumors are usually cast.

Original discovery has not been attempted; but with knowledge of the fact that the subject is always considered a bugbear by the student, the lectures only aim to impart the current information in a form intended to fix it in the memory.

The experience of the author in over twenty years of surgical practice has been freely made use of, and the statements made in the course are naturally such as square with the clinically observed facts.

For the last ten years the surgical wards of the Providence Hospital have afforded abundant material for the prosecution of the clinical study of tumors, and a specimen of every tumor removed has been submitted to my

friend, Prof. E. M. Schaeffer, the accomplished histologist, for his opinion and remarks.

In a short time it is proposed to supplement this volume by another on the "Tumors of the Regions," in which the operative surgery will be fully considered.

As these lectures only give the general pathology, clinical history, and treatment of neoplasms, the illustrations are necessarily limited to simple types, with the exception of the remarkable specimens inserted as surgical curiosities.

John B. Hamilton.

924 McPherson Square, Washington City,
October 30, 1890.

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CLINICAL STANDPOINT.

INTRODUCTION.

The purposes of diagnosis usually require that the microscope be employed in the examination of specimens. The student wishing to perfect himself in the knowledge of the histology of tumors should make their microscopic examination a part of his course, but it is certain that nearly constant practice in microscopic technic will alone produce satisfactory results. The busy and often overworked practitioner has sometimes little inclination to make sections and mount specimens, and oftener has no time to do the work. It thus results that in most places there are within reach physicians devoting themselves especially to microscopy, who may be depended upon to furnish a diagnosis at short notice and much more accurately than a diagnosis arrived at by imperfect methods of examination.

The appliances necessary for the histologic examination of tumors are: Jars for temporary preservation of the specimens; preservative fluids; staining fluids; microscope slides and cover-glasses; section cutter, or freezing microtome, or a special razor for cutting sections; watch-glasses; forceps; and a good microscope. Expensive stands and elaborate stages are not necessary, and scarcely desirable, but the lenses should be good and should well define the edges of the object. Four lenses, 1 inch, $\frac{1}{4}$ of an inch, $\frac{1}{8}$ of an inch, and $\frac{1}{12}$ of an inch (oil immersion), respectively, will be quite sufficient.

The easy solubility of the hemoglobin causes the fading of the material in ordinary preservative fluids. Hamilton, of Aberdeen, recommends the following composition:

"Make a saturated solution of arsenous acid in water by boiling; filter, and, when still warm, mix together equal parts of this, of glycerin, and of methylated spirit. It is well to mix the glycerin and arsenous acid solution, to heat them, and afterward to add the spirit. The advantages of this liquid are that it keeps the color of the organs better than spirit, it does not destroy their pliability, and it is a good preservative. If several organs are placed in one jar they should be separated by pieces of washed linen cloth; and a piece of the same, soaked in saturated solution of corrosive sublimate, should be placed over them. They should not be steeped long in water before being placed in the preservative; it is usually sufficient simply to wash them. Hearts, livers, kidneys, lungs, and muscular structures keep beautifully in it."

The fluid above described is only intended for the preservation of organs as preliminary to section-cutting.

Before proceeding to cut a section of an organ or pathologic specimen it is usually placed in a hardening fluid, and experience has shown the fluids best adapted to each variety. The reagents and solutions necessary are as follow: (Altered from D. J. Hamilton.)

1. Methylated spirit.
2. Absolute alcohol.
3. Müller's fluid.
4. Müller's fluid and spirit (one part spirit and three parts Müller's fluid).
5. Chromic acid ($\frac{1}{4}$ to $\frac{1}{6}$ per cent. solution).
6. Chromic acid and spirit (keep in the dark).
7. Perosmic acid ($\frac{1}{4}$ to $\frac{1}{8}$ per cent.).
8. Gold chlorid ($\frac{1}{2}$ to 2 per cent.).
9. Picric acid.
10. Decalcifying and hardening solution (Rutherford).

The solutions have the following formulæ:

3. Müller's fluid.

Potassic bichromate,	45 gm.	
Sodic sulphate,	20 gm.	
Water,	2 liters.	M.

10. Rutherford's fluid.

Chromic acid,	1 gm.
Water,	200 c.c.
Then add:	
Nitric acid,	2 c.c.

Frequent changes of the fluids are necessary when the

specimens are bloody, and friction with the tissue is prevented by wrapping each piece in a thin sterilized linen cloth before dropping it into the fluid. When the tissues have been sufficiently hardened to enable a thin section to be cut, the section after cutting may then be placed in an appropriate staining fluid.

I pass over the technic of imbedding and section-cutting, for full instructions may now be found in almost any recent work on pathology and in the different manuals of histology. After cutting the section, before staining it is usually dropped into a watch-glass containing glycerin.

The following carmin solutions are in common use as staining fluids:

(*a*) AMMONIACAL SOLUTION OF CARMIN.

Carmin,	4 gm.
Strong liquor ammonia,	6 c.c.
Water,	120 c.c.

Mix the carmin into a paste with a little of the water in a mortar, add the ammonia, and, when thoroughly mixed, the remainder of the water. (*D. J. Hamilton.*)

(*b*) BORAX CARMIN.

Carmin,	0.5 gm.
Borax,	2.0 gm.
Distilled water,	100.0 c.c.

M.
(*D. J. Hamilton.*)

These are mixed in a porcelain evaporating-dish and heated to boiling. To this bluish-red liquid, dilute acetic acid (about five per cent.) is added until the color

changes and becomes more like that of ammonia-carmin. It is allowed to stand for twenty-four hours, is then decanted and filtered. A drop of carbolic acid is added to preserve it.

(*c*) PICROCARMIN.

Carmin, ... 1 gm.

Dissolve in ten c.c. of water and three c.c. liquor ammoniæ in a mortar, add this to the 200 c.c. cold saturated solution of picric acid. Evaporate, either on a water-bath or by exposure to the air, to one-third, and filter. (*Ranvier.*)

(*d*) PICROLITHIUM CARMIN.

Carmin, ... 2.50 gm.

Dissolve in 100 c.c. saturated solution lithium carbonate. To this add from two to three c.c. of a saturated solution of picric acid. (*Friedländer.*)

There is also an alum-carmin and an indigo-carmin solution.

Freezing fluid:

Syrup (made of 28.5 gm. sugar and 30 c.c. pure water), ...	4 parts
Mucilage (made in cold water, 45.6 gm. of gum acacia to 2400 c.c. water), ...	5 parts
Water, ...	9 parts.

Boil and saturate while hot with boric acid; when cold, filter through muslin. (*D. J. Hamilton.*)

To stain nuclei, logwood is used. The following is given by D. J. Hamilton:

Hematoxylin,	12 gm.
Alum,	50 gm.
Glycerin,	65 c.c.
Distilled water,	130 c.c.

Boil, and while hot add five c.c. liquid carbolic acid. This mixture should be exposed to the sunlight for at least a month before using. This stains nuclei a most beautiful blue almost instantaneously after application. After the section has been stained, it may be placed on a slide and examined.

For directions for making museum preparations and mounting sections in permanent form, the student is referred to the large works on pathology and histology. It is impossible, in the scope assigned to these general lectures, to undertake to give directions for examination of the various micro-organisms and for "smear" preparations made according to bacteriologic methods.*

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* See Appendix.

LECTURE I.

GENERAL CONSIDERATIONS.

We are about to consider one of the most interesting subjects in the whole range of surgical topics; and when we think how often the patient's knowledge of his chances for life or death hangs on our diagnosis of a tumor, whether or not it is malignant, we can not fail rightly to regard its importance as second to no other. If we will examine the records of the civic hospitals in this and other countries, we will find that tumors of one form or another constitute a very large proportion of all the cases in the surgical wards, outside of the general class of injuries.

Technically, the term tumor is applied to a neoplasm only, but to conform to the existing nomenclature, which includes cysts, we define a tumor to be a generally non-inflammatory, abnormal increase of some of the tissues of the body, due either to retained secretions or new formation. The term tumor, surgically applied, means more than a simple swelling. If that definition were true, the colloquialism which makes use of the word tumor to describe the projecting end of a luxated bone would be correct.

I have said non-inflammatory, but our Professor of

Pathology will doubtless tell you it is a moot point whether or not certain new growths have their origin in the exudation thrown out in the inflammatory process. True inflammatory products are temporary in their character, and the part in which they are seen has passed through the various stages of inflammation, hyperemia, congestion, and exudation.

A tumor rarely terminates by a natural process. It grows until removed by the surgeon, ulceration takes place, or the patient is poisoned through the lymphatics. We may qualify that statement by saying that a tumor may occasionally be the seat of an inflammation; pus is formed by the infection and death of the exudate, and escapes; the tumor consolidates and contracts. This termination is necessarily rare and confined to certain non-malignant growths. As will hereafter appear, degenerative changes may occur, such as calcification and fatty metamorphosis, but these are necessarily rare.

Diagnosis.—A foreign body is sometimes mistaken for a tumor when imbedded in the tissues, especially when encapsulated. In one of the European universities, where the *code duello* was the rule, it is reported of Dupuytren that a medical student was brought to him who said he had a tumor which had been growing for some time. He thought it originated from an injury received in a duel. A conic swelling over the buttock was the outward indication. On cutting into the tumor, Dupuytren found the point of a sword.

The celebrated Professor South, who edited a translation

of Chelius, relates a case where a man was in bed smoking a chalk pipe, and while asleep received an injury. Time passed on, and a swelling supervened. He consulted surgeon after surgeon, until finally it was decided that there was a tumor in the cheek, which should be removed. Upon examination it was discovered that a piece of the pipe-stem, $1\frac{1}{2}$ inches long, had broken off in the cheek. In the Museum of the Royal College of Surgeons, London, there is a piece of glass mirror, which was found encysted in a patient's breast. The late Dr. Jos. M. Toner, of Washington, D. C., related to me a case where a wax tube, $1\frac{3}{4}$ inches in length, remained encysted in the breast for one year. There are numerous examples of encysted foreign bodies which are likely to be mistaken for tumors. In the Army Medical Museum, at Washington, you will find a specimen deposited by myself, consisting of many exfoliated pieces of bone, as large as a grain of rice and upward. These I found packed together and encysted in the thigh of a patient. From the history of the case, they appear to have been the bony debris of an antecedent abscess of periosteum.

Chemistry, in the diagnosis of tumors, is of little use. You will find that the same chemical elements enter into the composition of a tumor as into that of the body in general. With the microscope you have an exact means of diagnosis. To use the microscope intelligently, however, you must become an expert. It is not enough to make a thin section and place it on a slide. One must be familiar with the different forms of cells and animal

tissues; and constant and steady practice are required. The specimen must be properly treated by staining in order to render the bacilli visible and the structure distinct.

Hypertrophy.—Now let us compare morbid growth with hypertrophy. In hypertrophy there is no departure from the normal structure. The hand of a baseball player, the arm of a blacksmith, the leg of a *danseuse*, are well-known examples of hypertrophy. These hyperplasia are not circumscribed. We see the same increase of growth in the tissues of any organ called into excessive action for a considerable time.

Nomenclature.—The ancients recognized three grand divisions of tumors: *Tumores secundum naturam, tumores supra naturam*, and *tumores præter naturam;* but in the beginning of this century clinicians had practically agreed on an extremely simple classification of tumors by which they were divided into two great classes: benign and malignant. This classification was of practical utility. A benign tumor was one which did not directly destroy life; a malignant tumor was one which, sooner or later, destroyed life. It was, however, found that clinically these classes shaded into each other so that sometimes the line was obliterated. It was observed that a tumor which might be "benign" in the beginning became "malignant" later on. The advance of anatomic knowledge and of knowledge of the development of cells necessitated subdivision. Then the type of structure began to be discussed, and there was invented the term "homologous,"

meaning similar in morphologic structure to that of the organ in which the neoplasm grows; and "heterologous," meaning a variation from the normal type of structure. The degree of "heterology" was supposed to represent the degree of malignancy. This proved to be not all the truth. Virchow says: "One can not, in my opinion, distinguish these tumors according to the tissues in such a manner that tumors which inclose in themselves certain tissues may be regarded as homeoplastic, and those inclosing other types of tissues heteroplastic; on the contrary, the same species of tumor may be in one circumstance homologous and in the other heterologous—for instance, where you have a hair developed in the stomach or in a vessel wall, or a cartilaginous tumor growing in the muscle; if you have a mucous tumor growing in the bone, such a tumor would be a heterologous tumor—that is to say, a growth which may be like a normal structure, but not like the structure in which it is located." Broca has used the terms "homomorphic" and "heteromorphic" to denote similarity or dissimilarity of structure. The modern terms homotopia and heterotopia are perhaps more correct. Now we define hyperplasia as equivalent to the term neoplasm, except that a neoplasm must be circumscribed—that is, growths proliferating from a parent cell from the edges of the tumor. The large cancerous growths are usually single, primarily. So much for the general nomenclature, but I shall again revert to this topic when I speak of the classification.

Progress.—A tumor's growth varies according to the

relative malignancy of the tumor—the greater the malignancy, the more rapid the growth. A carcinoma (which is a malignant tumor) attains its growth and destroys the life of the patient comparatively soon. This is a very interesting point in the diagnosis, with reference to the future of the patient and with reference to an operation. If you have a clear case of slow-growing fibrous tumor, you need be in no hurry about operation. It does not destroy life, and its growth is comparatively painless. In a case of sarcoma or carcinoma, on the contrary, the growth is rapid, and surgical interference must be immediate if success is to be hoped for. Thus the rapidity of growth of a tumor is as a pilot to the diagnosis of its variety, and a sure guide to the therapeutics of the case. In regard to the diagnosis of tumors, the configuration and outward appearance give you something of an idea of the nature of the case. If it be a chain of glands which is involved, such as those of the groin, axilla, or neck, and there be a clear history of slow and painless growth, in that case you know that it is not a malignant tumor. If you find in the breast small nodules that feel like small nut-like bodies, but distinctly connected together in the gland by connective tissue, then you probably have carcinoma. Then in the cervix uteri, when carcinoma is present, it is common to find nodules. If you put your finger on the side of an unripe raspberry you have almost the same sensation by touch. Palpation in some circumstances does not give you a conclusive conception of the actual condi-

tion present. It may have progressed to the stage of abscess, and when that comes you simply feel fluctuation in the tumor.

The size of the tumor should be taken into account. I should, in speaking of the configuration of the tumor, mention that lipoma and fibroma are usually conic, and may weigh from a few grains to fifteen or twenty pounds. Their shape is sometimes to outward view as conic as a sugar-loaf. Such tumors frequently have a long, pendulous body (pedunculated). Cancerous tumors are generally broad at the base, and not very movable. The mobility of a tumor depends very largely on its site. If it spring from bone, it is fixed and immovable. If it be located on the soft parts, it may be movable. Sometimes it is located directly over an artery, and may then be mistaken for an aneurysm. The infiltration of the skin and tissues is another guide to the diagnosis of the malignancy or benignancy of a tumor. I doubt the literal propriety of the term "benign." I do not think a tumor, as we understand the term, is meant to be a part of the normal frame; in that sense all tumors are malignant. If you substitute the French term *bonne nature*, or good-natured, for benign, you have an expression of sentiment more properly characterizing those tumors which do not destroy life. The infiltration of the adjacent tissues by a tumor is quite a fair measure of its malignancy. We have, for instance, the carcinomata. We find that there is an infiltration or projection of epithelium, with much dense fibrous structure (*stroma*). The connective tissue is

separated laterally and great pain produced. The intense pain of a cancerous tumor is due to the pressure upon the tissues by infiltration, precisely as if a foreign body were gradually driven into the flesh. That is one direct reason for the pain. We do not find infiltration in a case of fatty tumor. It does not push anything but the skin out of the way, or when situated between muscles it simply separates them. I have now given you a general reason for painless and painful tumors, excepting those composed of nervous tissue, neuromata, which can not occur without producing pain. You would suppose that an intraocular tumor would be very painful, whether malignant or not, but the rule holds good even here. I remember a case that I referred to Professor Burnett some years ago (November, 1883). In that case there was no pain. The patient was unable to see the upper half of objects, and there was a growth filling the lower part of the posterior chamber of the globe. The globe was extirpated, and the patient in 1897, fourteen years later, was still living in the enjoyment of good health.

Color.—As the tumor is usually situated under the skin, not much can be judged from that. There are, however, certain tumors characterized by pigmentous infiltrations, so that two forms of tumor are named from the black pigment—melanocarcinoma and melanosarcoma. But papillomata are very frequently pigmented so they are quite black. The glandular extension of tumors depends almost entirely upon their malignancy. I will

take cancers of the female breast as an example. They are sooner or later followed by glandular infection. The fluid follows the lymphatic channels; the gland itself becomes infiltrated; cancer-cells effect a lodgment and set up a new growth like the original typical structure from which they sprang.

Recurrence.—You might suppose that rapid recurrence would be evidence of its malignity. Not so. You may remove a polypus, and it may recur in a few days. Polypus of the ear may recur very soon; it is the same with uterine polypi. So that the mere recurrence of a tumor is no evidence of its malignity.

Site.—The site of a tumor is variable; you may have one in almost any structure of the body. The ulceration of the skin over a tumor is a matter of time. The pressure of the clothing, or any injury to the skin, such as an abrasion whereby the skin may be infected, may, indirectly, produce ulceration. In the case of other tumors, where an inflammatory process has gone on, there will be a breaking down of the tissues, due to inflammation, and an abscess will result.

Vascularity.—The vascularity of tumors is sometimes considerable. Sometimes a tumor will be supplied by a blood-vessel of considerable size, and the vessel may grow proportionately with the tumor. In the late Professor Frank Hamilton's "Surgery," he describes a case where he was operating for an extensive tumor of the neck. He was explaining to the students there present how easy it was to separate the tumor from the tissues so that no

hemorrhage could result. He got ready to lift the tumor out, when a gurgling sound was heard, a gush of blood followed, and he almost lost his patient. He found that a large artery was attached to the tumor at the base—a thing that could not have been discovered before. He relates how easy it is to be surprised in a case of that kind, so that in operations you should at all times be prepared for hemorrhage. Remember that the venous blood-vessels are, not uncommonly, abnormally distended. In a sarcomatous growth you will find that the superficial veins are very greatly distended. You can see them swelling through the skin, almost changing the configuration of the tumor by their immense size, their profusion, and tortuous course.

Structure.—For our knowledge of the general pathology of tumors we must depend principally upon the microscope. Tumors may be called typical—that is, composed of typical structure—where they are formed of normal tissue. For instance, the fatty, fibrous, cartilaginous, osseous, and lymphatic tumors are typical.

All these are formed from structures like the type from which they are named; they are properly called typical. We may further classify them according to their constituent structure, as neuromata, lymphangiomata, angiomata, myomata, etc. Now the term *histoid* is applied to this class of tumors; that is to say, where they are composed of a single typical structure. A neuroma is a histoid structure. Then we have the *organoid*, where there is more than one kind of structure. The term tera-

toid is applied to the highest type of development of these abnormal growths. Also the "combination" tumor of Professor Gross, which consists of two or more different structures, as nevoid, cystic, fatty, fibrous, calcareous, or osseous, in the same neoplasm. It is not an infrequent thing to find several kinds of cells in an ovarian tumor.

Origin.—The origin of tumors is sometimes very obscure. They are frequently the direct result of an injury. Polypus of the nasal passage, for example, is apt to follow an injury to the nasal bones. The so-called cryptorchids, or persons whose testicles have not descended fully, or are lodged in the inguinal canal, are very apt to have carcinoma or sarcoma in the retained testicles, by reason, perhaps, of the pressure of the abdominal muscles or traumatism; especially if the testicles be partially descended so that they are lodged in the inguinal canal. In regard to the non-traumatic origin of a tumor, we have the cell theory of Schwann, by which the "caudate corpuscles" were the supposed progenitors of the fibers of connective tissue. That is the original theory on which all modern cellular pathology is based. Müller then followed with a study of morbid growths. Johannes Müller, you no doubt recollect, was the originator of the term "connective tissue." Then Vogel started the dyscrasia theory. That is the theory that the blood alone is principally affected; but, in fact, the solids as well as the blood are affected. Then the theory of "constitutional taint;" that is, that all cancerous growths depend upon constitutional taint, which involves the supposition of congenitally defective

cells. Then came Virchow (still living, in this year of our Lord, 1898, and at this time as active as ever), who, by the production of his immortal cellular pathology, laid down clear lines for the study of abnormal growths. His later work on tumors gave a classification which has been adhered to for a quarter of a century almost without change. Virchow adopted the law of Müller, "*which is in effect that the substance of all tumors has its counterpart in some tissue existing normally in embryonic or afterlife.*" Cohnheim, the pupil of Virchow, who died in August, 1884, believed that all tumors are congenital. They may exist in all forms, and are simply, while undeveloped, stored up for future use, and remain latent until the conditions are favorable for the formation of a new growth. Then we have the abnormal "nerve influence" theory; that the cell, by reason of some chemical change in its structure, begins the generation of an abnormal brood; but an atypical cell can not produce a healthy cell. It is impossible, within the intended scope of these elementary lectures, even to glance in passing at the various ingenious theories that have been propounded on the origin of tumors, and we can not to-day satisfactorily explain that indefinable factor in their production which we term individual susceptibility. We can not understand, for example, why one of a dozen shoemakers, each pounding a piece of sole leather on his thigh, should have a sarcoma of traumatic origin, and all the others escape. So, gentlemen, you need not fear but there are plenty of unsolved problems to engage your highest powers.

Microbic Theory.—Certain forms of tumors are now believed to be infectious in their origin, although not yet accepted by all. I refer to the malignant epithelial tumors. It has long been the subject of careful trial, but former methods of histologic study, while they demonstrated the method of epithelial *growth*, threw little light on the origin. The proliferation of the epithelial bud is an effect, not a cause. Thoma saw the coccidia in cancerous nuclei in 1889; and Malassez and Albarran confirmed their presence in the same year. Wickham and Darrier found them in Paget's disease of the nipple in 1889. Siegenbeck, von Henkelom, and others, working separately, found parasites in carcinoma. Russel, of Edinburgh, 1890, described a body which he constantly found in epithelioma, but other observers demonstrated that these were found in various tissues of the body during certain diseases, such as diphtheria and tuberculosis. Walker and Ruffer, as reported by the latter to the International Medical Congress in Rome, in 1894, found that by using a peculiar process of staining they could demonstrate the parasite in the fresh specimen. This method will be given when we come to study epithelioma. But many excellent pathologists yet deny the evidence showing the microbic origin of any neoplasm.

LECTURE II.

CLASSIFICATION.

In the preceding lecture I briefly referred to the classification of tumors. I do not pretend to defend the classification on which I shall base the description of these tumors. Why, then, you naturally say, do you use it? I answer, Because it is the nomenclature and classification originally adopted some years ago by the Royal College of Physicians of London and the American Medical Association. American physicians had a voice in the committee that drew up the nomenclature, at its last revisions, and I adhere to it simply for the purpose of uniformity. Professor Gouley, of New York, in one of the most learned works produced in any language on the subject of medical nomenclature, says of Virchow's classification:* "The high reputation of this great master in patho-anatomy has caused his nomenclature and classification of tumors to be largely accepted by the profession without question. This classification answered a good purpose twenty-five years ago, and was a forward step, but the advances since made in pathohistology forbid its continued use. Nevertheless, there

* "Diseases of Man: Their Nomenclature, Classification, and Genesis," New York, 1888, p. 334.

are many physicians and surgeons who still adhere to this arrangement of tumors. In the present light of science, probably no one sees better than Professor Virchow the faults of this as well as of all other classifications, and if his occupations should permit him to undertake its reconstruction, he would doubtless do so consistently on the anatomic basis which does not abrogate, but rather enforces, Müller's law. He would probably abandon the word tumor, and reject the hematomata, and also the cysts. He would drop the terms histoid and organoid, and place the teratoid growths under the caption terata, and make a very different disposition of the mixed growths of his fourth group."

Cornil and Ranvier, in proposing their classification, say that their aim has been "to treat simply from the histologic point of view, and we have therefore included under the head of inflammation and hemorrhage what seemed to us to rightly belong to them,—blood tumors, hygromata for example. We also think we have a right to reproach Virchow with having invented new words, drawn from gross physical characters, whereby to designate certain tumors, instead of employing words representative of the tissue. Thus, he uses the word psammoma to signify a tumor of the meninges, because it contains calcareous granules similar to fine sand, and the word glioma is applied to tumors of the brain, because they are of a consistency analogous to glue. He thus departs from the classification which Müller's law suggests, and which we intend to follow absolutely."

There is no denying the impeachment in the instances cited, but Gouley has pointed out that the authors are themselves inconsistent in many instances.

Cornil and Ranvier, however, admit that no anatomic classification can serve to determine the degree of the gravity of a tumor, and it must be apparent that the correct classification can only follow positive and unchanging facts of histogenesis. Recent research has shown us positively that certain forms of tumors, described by Virchow under the term "granulomata," are due to the presence of a specific micro-organism. I may particularly mention tubercle, lupus, syphilitic gumma, elephantiasis, and leprosy. This class has been accordingly dropped by the present revision.

I trust, therefore, that you will take our nomenclature as an arbitrary one, subject to decennial revision, as we now revise the Pharmacopeia, and bear in mind that we always will necessarily have considerable material for the Committee of Revision. Every man can not have his own classification, because there would then be no uniformity of terms in this branch of medical literature.

COMPREHENDING MALIGNANT AND NON-MALIGNANT NEW GROWTHS AND CYSTS.

From the Last Revised Nomenclature of the Royal College of Physicians (1896).

"In deference to the needs of the various registration authorities, a distinction has been made in the general and local tables between malignant and non-malignant new growths. The tumors are, however, here classified

according to their structure and the type of normal tissue they most closely resemble. To facilitate returns under the general tables, the malignant growths are here marked by two asterisks. In certain cases malignant and non-malignant growths are unavoidably associated under one head, as, for instance, under sarcoma; the name is then marked with one asterisk.

"Cysts are placed in a separate class, and may be returned severally among the local affections of organs; or among new growths (if connected therewith); or as malformations (if congenital); or as parasites (if parasitic)."*

CLASSES.

I. Tumors composed of one of the modifications of fully developed connective tissue.

II. Tumors resembling in structure, more or less closely, one of the more complex tissues or organs of the body.

III. Tumors composed of cells of an embryonic type sometimes tending to develop into one of the forms of connective tissue—sarcoma.

IV. Tumors composed of epithelial cells arranged in the spaces of a stroma of more or less perfectly developed and vascular connective tissue—carcinoma.

V. Cysts.

Class I.—Tumors composed of one of the modifications of fully developed connective tissue.

(The name of the typical normal tissue is printed first in each case, that of the tumor, second.)

1. Adipose Tissue. Lipoma. Fatty Tumor.
   - *a.* Circumscribed.
   - *b.* Diffuse. *Synonym:* Fatty outgrowth.
   - *c.* Multiple.
   - *d.* Nevo-lipoma.
   - *e.* Fibro-lipoma.

* The spelling is changed to conform to the American system.

2. Fibrous Tissue. Fibroma.
   a. Firm or hard fibroma, desmoid tumor.
      Fibrous epulis.
      Fibrous polypus of nose.
      Fibroma of nerves. *Synonym:* False neuroma.
      Keloid.
   b. Soft or areolar fibroma.
      Molluscum fibrosum.

3. Cartilage. Chondroma.
   a. Ossifying. *Synonym:* Spongy or cancellous exostosis.
   b. Non-ossifying.
      *Enchondroma (when growing in bone).
      Ecchondrosis (when growing from cartilage).
   c. Myxo-chondroma (when undergoing mucous softening).

4. Bone. Osteoma.
   a. Developing from cartilage.
      Cancellous or spongy exostosis.
   b. Developing from membrane.
      Compact or ivory exostosis.
   c. Of teeth.
      (1) Growing from the cement.
         Dental exostosis.
         Hypertrophy of cement.
      (2) Growing from the dentine.
         Odontoma.

5. Mucous Tissue. *Myxoma.
   Mucous polypus.

6. Neuroglia. *Glioma.

Class II.—Tumors resembling in structure, more or less closely, one of the more complex tissues or organs of the body.

(The name of the typical tissue or organ is placed first, that of the tumor, second.)

1. Muscle. Myoma.
   a. Unstriped. Liomyoma.
      Fibromyoma. Uterine fibroid. Fibroid tumor of prostate.
   b. Striped. Rhabdomyoma.
      *Myosarcoma.

2. Nerves. Neuroma or true neuroma.
   a. Medullated.
      Plexiform neuroma (in part). Bulbous nerves.
      Synonym: Amputation-neuroma.
   b. Non-medullated.

3. Blood-vessels. Hemangioma, angioma, or nevus.
   a. Capillary. *Synonyms:* Port-wine stain, mother's mark, telangiectasis.
   b. Venous. *Synonym:* Erectile tumor, cavernous nevus.
   c. With adipose tissue. Nevolipoma.

4. Lymphatic Vessels. Lymphangioma, lymphatic nevus. Congenital cystic hygroma of neck. Macroglossia.

5. Lymphatic Glands. Lymphadenoma.
   Hodgkin's disease.

6. Papillæ of Skin or Mucous Membrane. Papilloma.
   a. Squamous papilloma, wart.
   b. Columnar papilloma, villous growth:
      Of rectum. Of bladder.

7. Secreting Glands. Adenoma.
   a. Racemose adenoma (spaces lined with glandular or spheroid epithelium).
      (1) Resembling normal gland tissue. True adenoma.
      (2) With excess of firm fibrous stroma adeno-fibroma. Adenoid tumor.
      (3) With stroma of imperfectly developed fibrous tissue. Adeno-sarcoma.
      (4) With stroma containing mucous tissue. Adeno-myxoma.
      (5) With large cysts throughout the tumor. Adeno-cysto-sarcoma, cysto-sarcoma.
         With simple cysts. With intracystic growths.
   b. Tubular adenoma (spaces in tumor lined with columnar or cubic epithelium).
   c. Adenoma of ductless glands. Thyroid adenoma.
   d. Ovarian adenoma.

Class III.—Tumors composed of cells of an embryonic type sometimes tending to develop into one of the forms of connective tissue.

* Sarcoma :

1. Composed of small round-cells.
   a. With homogeneous intercellular substance. Granulation sarcoma. Encephaloid sarcoma.
   b. With reticulate stroma. Lympho-sarcoma.
   c. Ossifying sarcoma, osteoid sarcoma (osteoid cancer).
   d. Chondro-sarcoma (malignant chondroma).
   e. Glio-sarcoma.
2. Composed of large round-cells.
   With alveolar stroma. Alveolar sarcoma.
3. Composed of oval cells.
   With mucous intercellular substance. Myxo-sarcoma.
4. Composed of large spindle-cells. Fibroplastic tumor.
   a. Ossifying.
   b. Chondrifying.
5. Composed of small spindle-cells.
   a. Developing into fibrous tissue. Recurrent fibroid tumor.
   b. Ossifying.
6. Composed of round- and spindle-cells.
7. Containing giant-cells. Myeloid sarcoma.
8. Melanotic sarcoma, pigmented sarcoma.
9. Plexiform sarcoma, cylindroma.
10. Psammoma, brain sand tumor.

Class IV.—Tumors composed of epithelial cells arranged in the spaces of a stroma of more or less perfectly developed and vascular connective tissue.

** Carcinoma, or True Cancer :

1. Glandular or spheroid carcinoma.
   a. With little stroma and abundant vessels. Encephaloid cancer.
   b. With dense fibrous stroma. Scirrhus, or hard cancer.
      Variety : Atrophic cicatricial scirrhus.
   c. With colloid degeneration of cells. Colloid cancer (reticular or alveolar cancer) in part.
   d. With myxomatous stroma. Carcinoma myxomatodes.
2. Squamous carcinoma. *Synonyms :* Epithelioma, squamous epithelioma, chimney-sweeper's cancer.
3. Rodent cancer, or rodent ulcer.

4. Columnar carcinoma. *Synonyms:* Columnar epithelioma, adenoid cancer.
   a. With colloid degeneration of cells. Colloid cancer (in part).
   b. Arising in ducts. Duct cancer.
5. Thyroid carcinoma. Resembling in structure the thyroid gland.

Class V.—CYSTS.

1. Cysts arising from the distention of pre-existing spaces.
   a. Spaces lined with secreting epithelium. Retention cysts.
      (1) Acinous or glandular cyst of breast, pancreas, and other glands.
      (2) Duct cyst of the breast, pancreas, testicle, and other glands.
      (3) Galactocele.
      (4) Spermatocele.
      (5) Mucous cyst. Ranula. Labial cyst.
      (6) Sebaceous or atheromatous cyst. Wen.
      (7) Ovarian cyst from Graafian follicles.
   b. Spaces lined with flattened endothelium. Distention or exudation cysts, lymphatic cysts.
      1. Bursal cysts.
      2. Ganglion.
      3. Serous cysts.

2. CYSTS IN WHICH THE FLUID IS CONTAINED IN A SPACE OF NEW FORMATION.
   a. Blood cyst. Apoplectic cyst in brain.
   b. Degeneration cyst. In brain. In tumors.

3. CYSTS OF CONGENITAL ORIGIN.
   a. Inclusion cyst. Dermoid cyst.
   b. Cysts arising in the remains of fetal structures.
      a. Unobliterated branchial clefts.
         Deep cysts of neck.
      b. Unobliterated canal of His.
         Sublingual cysts in part.
         Subhyoid cyst in part.
         Cysts in front of larynx.
      c. Remains of Wolffian body.
         Encysted hydrocele in male (in part).
         Cysts of the broad ligament in female (in part).

d. Partially unobliterated processus vaginalis testis.
Encysted hydrocele of cord.

e. Partially unobliterated canal of Nuck.
Hydrocele of canal of Nuck.

f. Cysts of postanal gut.

4. Parasitic Cysts.

LECTURE III.

TUMORS COMPOSED OF ONE OF THE MODIFICATIONS OF FULLY-DEVELOPED CONNECTIVE TISSUE.

LIPOMA.

By the term *lipoma* we mean a fatty tumor; that is to say, a tumor composed of normal fat. There was once a term used—steatoma—to designate this class of tumors, but they were confounded with sebaceous tumors, and there is a great difference between them. The sebaceous cyst is, as you will remember, a retention tumor. It is due to retention of sebum. There is usually no cholesterin in the fatty tumor, whereas in steatoma there is cholesterin. Lipomata are composed of true fatty tissue. "The fat is contained in cells with membrane surrounding it, which cells are generally identical with the ordinary fatty tissue and contain the fat-crystals, but they are larger than the fat of the adipose tissue which they join" (Virchow). They are always proliferation tumors; that is to say, they vegetate from the parent cell. "Every lipoma is lobulated; that is, contains lobules between which are formed the connective tissue and

vessels" (Virchow). "Furthermore," says Quenu, "the tissue of a lipoma does not participate in the general changes of the surrounding tissue, for it almost preserves an independent vitality." In ordinary lipoma—a small

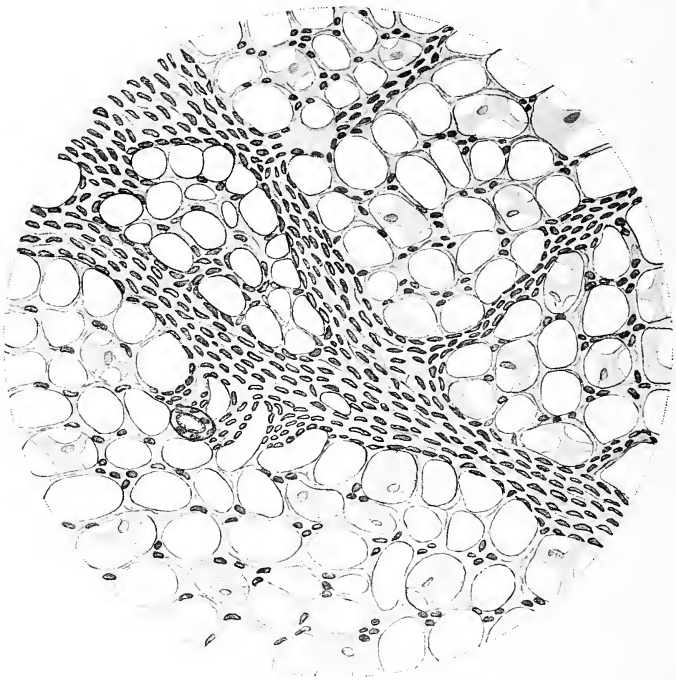

FIG. 1.—LIPOMA.—(*From Coplin's "Manual of Pathology."*)

fatty tumor—the fat greatly predominates over the connective tissue lying between the lobes; but we have several varieties (the fibrous, for example) where the connective tissue predominates. The lobes are smaller than

the ordinary variety. We may have still another form of lipoma—telangiectatic—where there is an increase in the number and size of the blood-vessels. Then we have the "petrified" lipoma—a calcareous degeneration and an osseous form. Finally, we have the epiploic lipoma, and lipomatous hernia, so called, where the epiploön has passed out through the hernial opening and fatty degeneration or proliferation has commenced. Subcutaneous lipomata, subserous lipomata, subsynovial lipomata, submucous lipomata, intermuscular (subaponeurotic) lipomata, and periosteal lipomata are varieties named from their situation with reference to normal fixed tissue. Lipomata are also named from their shape. Thus we have polypoid lipoma; that is, where the tumor has a foot stalk connected with the tissue. Then we have the arborescent, arranged like leaves on the branches of a tree. These tumors may extend into the serous and synovial membranes. So much for the normal varieties. We have also the so-called sclerous form, where there is hardening and induration. Sometimes cartilage cells are thrown out and form one of the so-called cartilaginous tumors, part fat and part cartilage. Sometimes it takes on cretaceous degeneration, where the outer layer becomes quite calcareous. Finally, we have fatty tumors in the parenchyma of the organs. We find them in the liver, in the kidneys, and in the brain. Ordinarily the lipoma is a single tumor, but occasionally you will find a patient who has several tumors in different parts of the body, but they seem to have no

connection with one another. But there is this difference between obesity and lipoma: let the patient be put on low diet,—starvation diet, if you please,—and the fat which is connected with the general circulation, and is deposited in the natural places, will be absorbed, and the patient will become less stout, whereas in lipoma no amount of starvation will diminish the size of the growth.

Progress of the Tumor.—Inflammation is somewhat rare; the tumor is painless and its growth is slow.

I have said that lipomata were painless, but there is a variety having a connection with the nerve filaments which are painful on pressure. Occasionally, from weight and pressure of the clothing, inflammation of adjacent tissues will result. It is usually mild in degree, but may occasionally progress to the formation of pus, ulceration, or even gangrene, from obstruction of the blood-vessels going to the tumor. Ulceration may also be caused by the friction of the clothing in large lipomata.

I have seen a lipoma over the buttock of a young man twenty-two years of age. There was an opening into it where the skin seemed to have been rubbed through, about the size of a silver dollar, through which the fatty structure could be distinctly seen. It was painless, and from the open ulcer there was a malodorous serous exudation. The tumor would weigh perhaps twenty-five pounds, but the patient was unwilling to let it go, it having been his constant companion for many years; I

could not persuade him to part with it at the time, and I lost sight of him.

Treatment.—The treatment of lipoma is extirpation, no remedy having been found that will exercise the slightest influence over its progress or retard its growth.

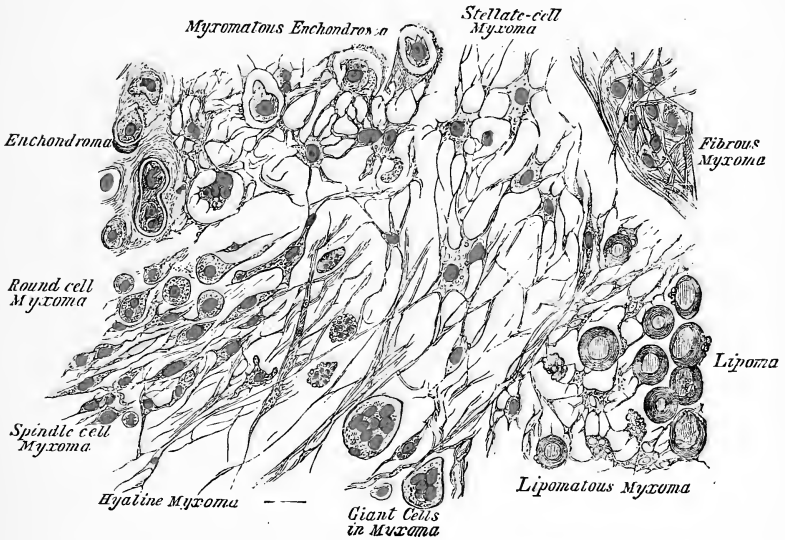

Fig. 2.—(*After Bryant.*)

The diseased skin should be removed with it, and every prolongation, every lobule, should be removed; otherwise there may be a recurrence. According to Senn, special precautions should be taken to prevent sepsis, as the bed of the lipoma, rich in blood-vessels and lymphatics, affords a fertile field for the propagation of pyogenic germs.

FIBROMA.

The fibroma is a tumor exclusively composed of completely developed fibrous tissues. The several varieties are as follows:

a. Firm or hard fibroma (desmoid tumor).
1. Epulis.
b. Keloid.

The diffuse fibroma is a subvariety. Then the papillary and the polypoid, of which there is one variety, molluscum fibrosum, and the tuberous with its variety, the epulis, bony, and the keloid. Now, recollect that I mentioned in the beginning that the proliferation tumors were the new growths, the true tumors. All tumors, as I said, may be broadly classified into two general forms: neoplasms and cysts,—neoplasms where there is a new growth, and cysts where there is a retention of normal fluid. There is another term or synonym which makes the word proliferation clear, and that is vegetation tumors—tumors characterized by budding. In their origin they are due to the preliminary stage of the inflammatory process, the stage of irritation, preceding the congestion. The proliferating tumors exceed in number those of any other of the four classes. There were more than fifty-six varieties of the proliferation tumors under the old classification. They may grow from the cartilage, the bone, the periosteum covering the bone, or from any tissue of the body; and the substance of the fibrous tumors may be composed of any one of these structures.

So much for the proliferation tumor in general. We will first take up that class of tumors composed almost exclusively of connective tissue—that is, fibrous tissue. The word fibroid is also used to describe the fibrous tumors. The term desmoid has also been proposed, because of its resemblance to the ligamentous tissue. The fibrous tumors are to be considered as wholly composed of connective or fibrous tissue. Sometimes, however, in the interstices between the fibers, we find cartilage cells and bone cells, or cells of any other natural structure, but they are always natural tissue cells. They may be, according to the Virchownian classification, heterologous,—that is to say, a cartilage tumor developed in a muscle is a heterologous tumor, because it is developed and grows away from its normal situation, although the tumor itself may be composed of tissue entirely normal,—so there is no departure from the normal type. The seat of a fibroma may be anywhere in the body. The uterus is a favorite seat of "fibroid" tumors. These, as you know, usually contain muscle cells, hence are called myofibromata. I will not now stop to describe fibrous tumors, but will say in passing that they are very slow in growth and very firm in texture, owing to their structure. They are also painless, except where they have developed on the brain, spinal cord, or in the substance of a nerve. The fibromatous neuromata are very painful, and they are the only ones attended by pain. So much for the general characteristics by which they may be recognized. They are called false neuromata.

When a particular organ is involved, there are special means of diagnosis adapted to the organ in which the fibroma is seated. The first, or diffuse form, is elephantiasis. The seat of this disease is in the skin. We say it is diffuse because in the more limited form it may be papillary,—that is, enlarged papillæ,—or it may be polypoid, or it may be tuberous, the so-called tuberculosis

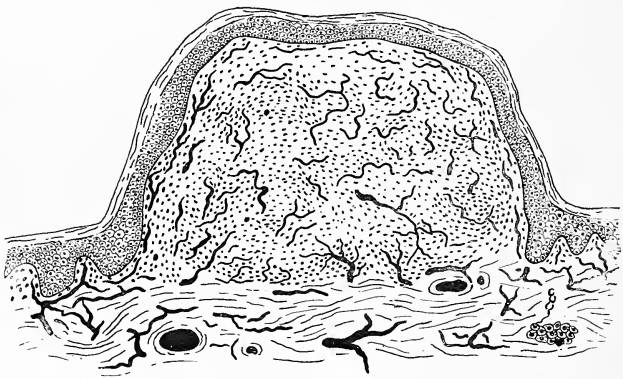

Fig. 3.—Molluscum Fibrosum.

of skin. We have still another variety of the papillary form, known as the verrucose or warty fibroma.

The papillary form of fibroma is simply hypertrophy of the papilla in the beginning, but finally a papilla grows out from the cutis, and grows very large. It is sometimes pedunculated—that is, has a foot stalk. It grows late in life. It is not confined, however, to the skin, but is found sometimes in the brain, in the breast, and in the bladder. There may be on the surface of the

uterus 100 or more. The polypoid variety is the fibrous variety of polypus as distinguished from the mucous variety. It originates from the connective tissue lying just underneath the mucous membrane, and pushes the mucous structure out with it. The mucous polypus—that is, one composed of mucous tissue—is quite soft and liable to bleed. The fibrous polypus does not bleed. Wherever accessible, the remedy is extirpation. One of the varieties of polypoid form is the *molluscum fibrosum;* that occurs all over the body, particularly on the face, neck, and trunk, and is a small tumor, varying from the size of a pea to a walnut, quite movable, and entirely painless. I have here a report of a case made by Dr. Hamlin, of Bangor, Maine, found in Marine Hospital Report, 1882. He sent me the tumor, and through the courtesy of some of my friends in the Navy Medical Department I had it photographed. It is the only photograph of that kind with which I am familiar. We had a very handsome heliotype made from it, which I will show you.

The photograph gives a clear idea of the structure of the tumors. It is not so good as the one in Virchow, but perhaps it represents a different section of the tumor, this being transverse, whereas that of Virchow is apparently longitudinal in section. A year later Dr. Hamlin reported another case. He says:

In February, 1882, I had the honor to forward to the Department the report of a case of molluscum, which appeared in the annual report of the Marine Hospital

Service for the same year. On November 27th last, Charles M. Smith was admitted to the Marine Hospital at this port, suffering from acute cystitis of one week's duration. In making an examination of this patient I at once recognized another case of molluscum. He removed to this State (Maine) when a child, and performed ordinary coarse labor until about twenty years of age, since which time he has been a sailor, sometimes going before the mast, at other times acting as steward. His health had always been good up to the recent attack of cystitis. His family record revealed no history of morbid growths of any kind. Fifteen years ago he first noticed these tumors on his face and neck, and since then they have from time to time appeared on other parts of the body, causing neither pain nor discomfort. These growths were particularly numerous on the face, forehead, neck, and trunk. They were fewer in number on the extremities, though, as a rule, larger in size; several on the left side of the thorax, as well as one over the left patella, ranked among the largest. There were none on the scalp, and, excepting one over the left instep, none below the knees. These tumors were too numerous to count accurately, but I estimated that there were about 300. In size they varied from a pin's head to that of a large marble. None were pedunculated; some were oval, some dome-shaped, while others were nipple-like in form. To the touch they were rather soft superficially, but fibrous in their interior. It would appear in this case that the tendency of the lesions was to increase in number, and to any considerable extent in size. It is interesting to note that the mental powers of this individual were decidedly dwarfed. This patient was unwilling to part with any of the growths, and consequently none could be obtained to examine microscopically.

These cases are of decided interest. I have in my mind now a medical man whose face and neck are entirely covered with these fibroid tumors. There is no danger to health from any of the fibromata, with the single exception of the epulis. The tuberous fibroma may, when situated on the gum, undergo sarcomatous substitution. It is simply another form of the fibrous growths, taking its origin from the periosteum. For the most part, all these tuberous fibromata are characterized by multiplicity. It is in this class of tumors that the subvariety of tuberous fibroma is found in the fibrous epulis. This is a small tumor situated on the gum, usually springing from the periosteum of the socket of the tooth. If the tooth be not removed, caries follows, and the growth is first noticed as a little warty excrescence along the side of the tooth. When the surgeon is called, not infrequently it is found that caustics have been applied, and the tumor removed down to the gum; but its rapid recurrence has created alarm on the part of the patient, and he thinks that perhaps the growth is cancerous. But, recognizing that the tumor springs from the socket of the tooth, it will be readily seen that the removal to the level of the gum does not prevent recurrence. The proper remedy will be to remove the tooth, and scrape out the tumor from the alveolus. A careful microscopic examination should be made to distinguish this from the sarcoma form, where the connective-tissue cell is undeveloped. This is the same form that is seen growing from the periosteum of the cranium, the bones of the face, the tibia, and the clavicle.

Fig. 4.—Fibroid of Thigh (Front View).

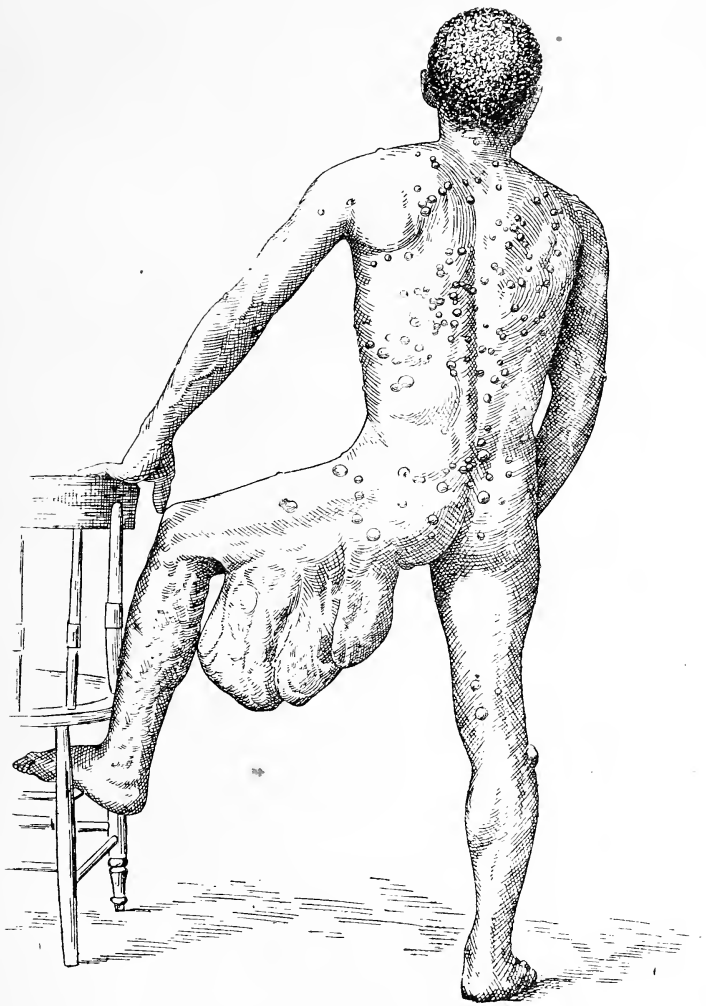

FIG. 5.—FIBROID OF THIGH (BACK VIEW).

There are numerous forms of fibromata that are called by Virchow "heteroplasia," because they have a tendency to form different structures from that in which they grow. For example, osseous fibromata do not proceed from the connective tissue, but from the medullary membrane, or from the periosteum.

Keloid.—The last form is the keloid. This usually occurs after burns or in cicatrices. Some of you may remember a negro who was a patient in Providence Hospital several years ago, with an extensive burn of the neck and side of the shoulder. In every one of the scars that formed by cicatrization of the tissues a small tumor developed. That tumor was the keloid. It is very liable to recur after extirpation unless removed deeply. It is non-malignant in character, and should cause the patient no annoyance except to appearance. I have seen a great many of these keloid growths growing from the lobe of the ears after piercing for ear-rings. They sometimes grow to an immense size, as seen on cicatrices after operations.

CHONDROMA.

These tumors are composed of cartilage. There are three varieties of chondroma: The ecchondroma, the enchondroma, and the osteoid enchondroma. The ecchondroma is a tumor arising directly from the cartilage. Quenu excludes the ecchondromata from the chondromata, but our classification, as you have noticed, places them as a subvariety. The enchondroma rises

from the connective tissue, the bone, or the periosteum. We have the ecchondroma most frequently in the larynx and trachea, springing from the cartilage; if on the internal aspect, they speedily destroy life by obstruction of breathing, unless extirpated. We find it also in the symphysis pubis, where it grows to a great size. Also in the spheno-occipital articulation in the early period of

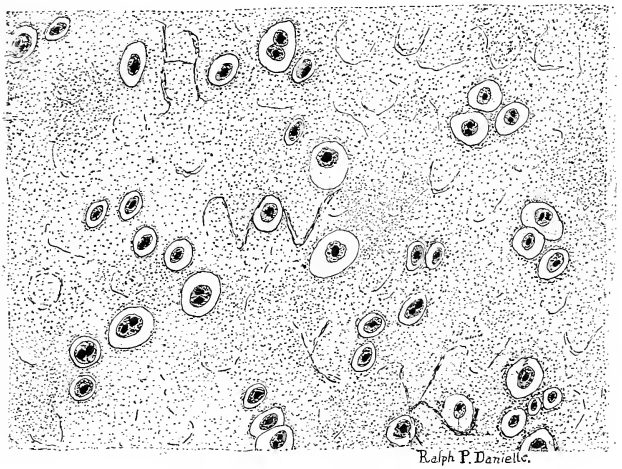

Fig. 6.—Hyaline Chondroma.

life, springing from the edges of the fontanel. Death results from perforation of the dura mater. Then we have enchondroma of the intervertebral cartilages, and from the occipital cartilages. We have in the chondroma, as well as the myxoma and lipoma, the so-called heterologous growths. Ecchondroma may also grow

directly from the interarticular cartilage of the joint. The chondromata are always encapsulated.

In the first year of my practice I had a case of enchondroma on the finger of the right hand of a farmer, who said the swelling was caused by the plow handle. He consulted several practitioners, and a great many diagnoses had been given. I advised the removal of the tumor. On cutting down I found a tough, white, dense, fibrocartilaginous structure, springing from the periosteum. The patient recovered and the tumor did not recur. I had a case of a private patient in Providence Hospital, where the tumor, about the size of a walnut and distinctly cartilaginous, developed on the right thigh, springing from the fascia lata. The cartilage cells, you remember, are from $\frac{1}{700}$ to $\frac{1}{500}$ of an inch in diameter. The tumor gave him considerable pain by rubbing against his clothing, and was in the way of his hand when he put it in his pocket. He said he almost invariably struck the tumor. It was removed with some difficulty, owing to its fibrous connective tissue attachments.

Chondromata are generally non-malignant, but they occasionally recur after extirpation. Mussey reported a case some years ago where enchondroma commenced in the hand, which was amputated. It followed in the arm, which was amputated, and finally proceeded to the shoulder of the patient, who lost his life. Syme had a case where the shoulder was amputated for enchondroma of the arm, and it recurred in the stump and

in the axilla. Virchow reports a case of enchondroma of the scapula where the tumor was removed seven times, and the patient finally recovered. The next variety is *osteoid chondroma.* This is composed of osteoid tissue, but is more properly classed as an osteosarcoma. The chondromata undergo fatty degeneration and sometimes a myxomatous transformation. There is sometimes a veritable cachexia in the cases of large osteoid chondromata, and metastases have been observed, being carried by both veins and lymphatics. There is great vascularity in these osteoid enchondromata, and extirpation is the only remedy, but care must be exercised in extirpating those springing from epiphyseal cartilage. In these tumors, wherever the bone is involved, amputation is the only remedy.

LECTURE IV.

TUMORS COMPOSED OF ONE OF THE MODIFICATIONS OF FULLY-DEVELOPED CONNECTIVE TISSUE—(continued).

OSTEOMA.

The next variety of tumor is the osteoma, or bone tumor. We have, first, the eburnated osteoma, where the bone is harder than normal; it differs from bone in the apparent absence of blood-vessels and cancellous tissue; the bony canals have become obliterated by the hardening process. We have in some cases the cancellous or spongy osteoma, which merely differs from the other bony tissue by being a hyperplasia of the normal cancellous structure, simply an increase of growth. We classify into exostosis. Exostosis of the bone is an extra deposition of osseous particles, which grow in an irregular shape. Sometimes the bone becomes one-third larger than normal. Now, that is entirely homologous—that is, like the normal bone. We have the heterologous class of osteomata in what are termed osteophytes (nodosities). That is where bony structure is developed away from the bone. These osteophytes usually grow from the articular cartilages, cartilage cells being formed with the true bony structure. Sometimes they grow from the con-

nective tissue, but usually from the cartilage. The periosteal nodes, due to syphilis, fall under this category. They are formed as a result of the subperiosteal exudate containing osteoblasts. Rarely we find them growing after a fracture. There is what is termed the bony, or ossific, diathesis—that is, a tendency to produce bone anywhere. In the muscles it is seen and described as "myositis ossificans." We find it occasionally in chronic rheumatism of the articular variety, and in gout. This form rarely falls under the observation of the surgeon unless the tumor becomes so large as to inconvenience the patient. Odontoma is a term applied to an exostosis composed of dentin growing from the dentin of a tooth.

The treatment of osteomata is extirpation when they become large enough to cause inconvenience, or by pressure on adjacent tissues to cause pain. The chisel and mallet are required.

BONE CYSTS.

Bone cysts, as you may readily imagine, not having any normal mucous structure, must always originate by softening, and are, therefore, practically "exudation" tumors. Of the bony cysts to which I will direct your attention, perhaps the most important are those of the upper and lower jaw. These cysts are usually in the beginning multilocular,—that is to say, divided into compartments,—but finally become monolocular. Sometimes we find them in the upper jaw, constituting a cystic degeneration of the antrum Highmorianum.

In this cavity the mucous lining first becomes irritated at some point, where a papilla appears and a cystic degeneration takes place. Sometimes these cysts entirely stud the inside lining membrane of the canal. In other instances they coalesce and fill up the antrum, and after a while push out its walls so that the face is much deformed, and the jaw becomes diseased. Sometimes these cystic tumors of the upper jaw spring from the alveolar projection of the socket of the teeth, where the fang projects into the antrum. If you examine the inside of the upper jaw, you will see that the fangs of the teeth projected deeply into it, covered by the bony alveolar process. Sometimes a cystic degeneration takes place from the alveolar process on the outside. We find it occasionally in the case of delayed or displaced teeth, and sometimes in the case of children, where the temporary teeth have been delayed far beyond the normal period. Occasionally the permanent teeth are delayed, and a cyst forms which contains teeth. These are called dentigerous cysts.

The size of a tumor of the antrum may vary from the size of a pea upward. Sometimes they will be proliferating and hard by inspissation, and you will scarcely know them to be cysts except by examination after removal. At other times the face is greatly distorted and deformed. The contents of these cysts will be found the usual color and consistency of cystic tumors elsewhere in the body. There is generally a pea-green, albuminous fluid, thinner than the white of an egg, which upon examination is sometimes found to be highly albuminous.

Sometimes the contents of these tumors calcify; chalk concretions are formed and disappear; occasionally, by reason of the rapid growth of the cyst and infection from mouth bacteria, inflammation is set up, when, by means of the suppurating process, we have a spontaneous cure. All these cystic tumors, especially the benign class, are of very slow growth, and that is one point in the diagnosis. Where they form in the upper jaw, a bulging will take place which not infrequently forces the hard palate down into the mouth. Not uncommonly you will observe that the bony wall has become thinned, and comes away with the periosteum when a flap is raised during operation. You can sometimes see that the hard palate is pushed down almost to a level with the teeth, and by the finger you can push into the tumor or feel it fluctuate. These tumors are not painful as a general thing.

Diagnosis.—If you take into account their painlessness, their slow growth, the absence of any constitutional taint, the character of the fluid on examination, you may give a pretty positive diagnosis as to the character of the tumor.

Treatment.—There are several methods of treatment. You may open the cyst and evacuate the contents, trusting to nature for a sufficient amount of inflammation to be caused to complete the cure. Or you may push a trocar into the tumor and evacuate its contents, and then inject it with iodin. That is, perhaps, the best method; but you must take care that every part of the diseased membrane is reached by the iodin. When these tumors

are very large, you will usually find that the simple tapping and injection of iodin will not perfectly cure them; so that you must thoroughly extirpate them with the knife and bone-gnawing forceps, and the curet or sharp spoon, arresting any hemorrhage during the process by means of Pacquelin's thermocautery, or the electric cautery.

Cystic tumors of the lower jaw usually appear near the upper border of the bone. They usually originate in the cancellous structure of the bone—that is, between the two plates, so that in case of cystic disease of that bone it separates the plates. It is not true, however, that the two plates diverge equally; the inner plate being thinner, the tumor encroaches more on the mouth. A cystic tumor of the lower jaw is usually quite painful, owing to the pressure upon the inferior dental nerve at that point, and, perhaps, to the stretching of the nerve. I have spoken of the malignant form of cystic tumor, and should tell you that cystic tumors of the lower jaw are very apt to take on malignant forms—that is to say, epithelial cells may be developed therein. Multilocular cystoma of the lower jaw is frequently cancerous, so it is very important to make an accurate diagnosis, which can be done only by the aid of the microscope. You also find that in these tumors the ordinary cystic tumor does not recur after extirpation.

It is only necessary to thrust the trocar into the cavity of the tumor, evacuate the contents, and inject tincture of iodin. Some surgeons press the bony walls together

with the thumb and finger, in order to crush the outer plate; this is not always practicable, although the plate is thin. When a sarcomatous tumor has involved the bone so as to cause its enlargement, you will find it necessary to remove the entire bone, by making an incision, separating the bone at the symphysis with a chain-saw, and disarticulating the lower jaw. When the periosteum can be saved, it is very desirable to do so, because a bony structure may be formed which will aid in preserving the normal contour, and prevent deformity. This is to be done by subperiosteal resection, an operation much easier described than performed. If not, you have done no better nor worse than the majority of cases; but you have at least had the satisfaction of curing your patients, for they almost invariably get well after the operation.

Odontoma is a bone tumor growing from tooth germs or from teeth still in process of growth. Sutton has given the following varieties:

1. Epithelial odontoma.
2. Follicular odontoma.
3. Fibrous odontoma.
4. Cementoma.
5. Compound follicular odontoma from the tooth follicle.
6. Radicular odontoma from the papilla.
7. Composite odontoma from the whole germ.

MYXOMATA.

Myxomata are the mucous tumors, including mucous polypi. They differ from the mucous cysts, with which you might confound them if your attention were not directed to them, in this: The mucous cyst is simply an obstruction of a mucous gland, whereas myxoma is composed strictly of mucous tissue of the same character as the Wharton's gelatin of the umbilical cord. It is not a cyst, but a vegetative or proliferative tumor. These tumors are all soft and painful. They differ from the fibroma in that they are composed less of connective tissue than of mucous tissue, and they do not impart that hard feeling that is found in the fibromata. Sometimes we have fluctuation in them; that is, where the mucous glands have been stimulated, secretion increased, and mucus accumulated. The myxomata are very frequent in the eye. We have them in that situation as the "hyaline." They may be seen sometimes in the aqueous humor, and are harmless. Virchow terms them heterologous, but they are true mucous tissue, although technically heterologous. We term it medullary myxoma where the myxoma starts from the medullary membrane. When a myxoma liquefies, we term it cystoid, because it is like a cyst, although not a true cyst. Whenever the connective tissue predominates over the mucous tissue, it is then termed fibrous myxoma; and when fat-globules predominate, it is called lipomatous myxoma. When the cartilaginous prevails, it is called cartilaginous myxoma.

So it is with the increase of blood-vessels, when it is termed telangiectatic myxoma. Then there is the myxoma peculiar to females. We have a myxoma of the placenta, which was formerly called cavernous mole, and "hydatids" of the placenta, but is now known as myxoma. The heterologous myxoma may be developed in any organ or tissue of the body. The nerve sheaths are very common sites for myxoma—the neuromatous variety. I have spoken of the fibrous tumor of the nerves, the neuroma, so called. There is also a myxomatous neuroma composed of mucous structure, which gives rise to as much pain as the fibrous neuroma. The diagnosis of myxoma is always uncertain before removal. It usually requires a microscopical examination to determine the nature of this tumor. Usually it does not recur after extirpation, but occasionally it does, and then it generally assumes the so-called malignant form. The tumor may not be malignant in its incipiency. It may not be malignant in most of its growth; but sometimes a change in the cells commences and a marked departure in the type of its issue, by the development of epithelial or sarcomatous cells, and then the tendency to destroy life is developed.

I removed a myxoma from the frontal sinus in a youth of eighteen, in February, 1897, at the Presbyterian Hospital; the tumor returned and pushed downward the orbital plate over the left eye, so there was marked exophthalmos. It was again removed in November, 1897. After each operation the wound healed kindly and promptly.

GLIOMA.

**Glioma.*—Following the nomenclature, I shall fix to glioma an asterisk to denote that it is malignant. As its etymology would indicate, it is a gelatinous tumor. Virchow gave the name to this tumor, which comes from the gelatinous substance between the nerve proper and the connective tissue of the nerve—the gelatinous substance of Rolando. This, you will remember, differs from the neuroglia proper (the reticulated tissue of the spinal cord). The tumor is found most frequently on the retina and choroid. Williams states it is the only tumor of the retina; but other forms of sarcomata are frequently found among the intra-ocular tumors. It is highly malignant, and invariably destroys life. An operation may prolong but does not save life. It was formerly termed encephaloid, but, as I shall show you in speaking of encephaloid, there is a very marked and wide difference between glioma and encephaloid. Occasionally we have glioma of the mucous surfaces, or springing from the nerve; again, we have them intermixed with mucous structure—myxogliomata. Gliomata on the serous surfaces, the arachnoid for example, are harder than these, which are always soft. The former approach to the fibroma, and are sometimes called from that circumstance fibroglioma. It has been lately asserted that the glioma is a variety of the round-celled sarcoma, a view adopted by most recent pathologists. It is, I may say, a disease almost entirely of early life, very seldom occurring in the adult, and in

this respect markedly different from ordinary sarcoma. Sometimes the gliomata have branching, spider-like cells, called Deiters' cells. These tumors may take on calcareous or fatty degeneration. On looking into the pupil of a child affected with glioma, we find a white, glistening appearance, sometimes called the "cat's eye." There is great tension and great pain. Sometimes after the eye has been enucleated we find that the disease has extended along the optic nerve and into the substance of the brain; occasionally it breaks out afresh, extending to the soft structures in the orbit. In the "American Journal of Medical Sciences" for October, 1884, I find a case reported by my friend, Dr. Dickey, of Wheeling, which is so typical that I shall take up your time by reading it:

Virginia ———, a bright, attractive child of very fair and beautiful complexion, when two years old was found to be entirely blind in the left eye. The pupil was widely dilated, and through it shone a satiny, lemon-colored reflex. There was some ptosis and convergent strabismus. None of the vessels were congested, nor had there ever been any evidence of pain. The growth was probably congenital, for shortly after birth the child's aunt had noticed something peculiar about the eye, and in a picture taken at three months can be observed a slight degree of ptosis and deflection inward and upward.

The little patient was examined by several prominent surgeons and oculists of Philadelphia, where the family then lived, and enucleation was advised. The operation was performed successfully a few months later, and there was never any recurrence in the left eye. Six months

afterward vision began to fail in the right eye, and the child was taken to Philadelphia, — the family having removed to this city in the meantime,—but an ophthalmoscopic examination revealed nothing but a slightly congested condition of the retina. In the following fall vision had entirely failed, the ball being constantly turned upward in a vain effort to see. The pupil gradually became dilated, and the same salmon-colored reflex could be observed that had been noticed in the other eye. The tumor gradually grew until it could be easily seen in a good light at the distance of several feet. It appeared to be lobular in form, and tortuous vessels traversed its surface. These were plainly visible as the refracting media retained their transparency. The pupil became dilated *ad maximum*, tension increased, the scleral vessels were congested, and attacks of sharp pain became frequent. An operation was deemed advisable, and on January 15th, with Dr. R. W. Hazlett and Dr. E. L. Hoge, I removed the globe. We found the optic nerve considerably thickened, and resected it as far back as possible, removing some of the orbital cellular tissue about the nerve. We made a microscopic examination of the eye, and found the sclerotic coat near the ciliary region very thin and almost ready to burst. The vitreous humor had degenerated into a dirty, watery fluid full of floating specks of caseous matter. On the back wall of the eye, with the papilla as a center, was a tumor the size and shape of a Lima bean. The specimen was sent to Dr. Knapp, of New York, who kindly examined it microscopically, and reported that it was a well-characterized glioma of the retina, spreading to the surrounding choroid by a cake-like transition.

There was a speedy recovery from the operation, but

on March 1st, about six weeks after the enucleation, the tumor re-appeared in the right orbit, and grew rapidly, pushing out between the lids. It assumed a cylindrical form, and extended from the orbit about six inches, with a circumference of about nine inches. The tumor was covered with the stretched integument of the lids out to the end, where it presented a rough, fungous, bleeding surface, which eventually became quite offensive, having the heavy, peculiar odor of an open cancer. The growth hung downward by its own weight, projecting so far as to make it difficult for the little sufferer to drink from a cup, and pressing upon the nose until the right nostril was occluded, and the left considerably obstructed. The cervical glands became very much enlarged, especially on the affected side, and the inguinal glands of both sides were indurated. Several metastatic tumors formed on the head, the first one, which appeared in the lambdoidal portion of the occipital bone, attaining the size of a hen's egg. The other tumors, ranging in size from a hazelnut to an English walnut, were on the parietal bones. They were quite hard, and were probably caused by metastases in the diploë, as described in Case 1, and illustrated in figures 10, 11, and 12, in Knapp's work on "Intra-ocular Tumors."

The patient gradually grew weaker, becoming greatly emaciated, and died of exhaustion July 25, 1884, four years and three months old, about a year and a half after the first enucleation, and about six months after the second. She retained full consciousness to the last. There was entire absence of cerebral symptoms through the whole course of the disease. The child was an unusually intelligent one, and at no time was there perceptible dullness of intellect. A postmortem examination could not be obtained.

I read this case in detail, because it gives you a better idea of the growth and progress of glioma than hours of lecturing on obscure conditions of that kind.

MYOMA.

The tumor is composed entirely of muscular structure. Both kinds of muscular fibers, the striated and the non-striated, enter into it, so that we find it in both the voluntary and the involuntary muscles. When the tumor is composed of striped muscular tissue, it is termed *rhabdomyoma*, and when of unstriped muscular tissue, it is called *liomyoma*. Where there is a great abundance of connective tissue in the myoma, it gives rise to great difficulty in diagnosis between myoma and fibroma. Where thus mixed, the tumor is called *myofibroma*. These tumors are non-malignant and entirely homologous. They frequently have hemorrhage as one of their symptoms, due to a rapid growth, great vascularity, and to the weight of the tumor. It is a passive hemorrhage. It also sometimes takes on cystic degeneration, where the tumor is broken down. We may have the occurrence of telangiectasis where the tumor contains an excessive number of anastomosing capillaries or blood-vessels. They are sometimes cavernous and sometimes varicose. Carcinoma occasionally takes the place of myoma. The tumor then becomes infiltrated with epithelial cells, and

as the disease departs from the normal type by displacement and degeneration of the muscle cells, becomes true carcinoma; so it is scarcely proper always to say to a patient afflicted with myoma that it is non-malignant, as there is a possibility of the carcinomatous substitution. The liability to this substitution is admitted, but on account of that liability, however limited, it is better to give your prognosis with exceeding care. The most common seat of myoma is in the uterus, and in that situation, owing to the greater abundance of connective tissue between the muscle cells it takes the form of myofibroma.

The diagnosis is a matter of considerable difficulty. The tumors are comparatively slow in growth, which distinguishes them from carcinoma. They are comparatively painless,—another point where they may be distinguished from malignant tumors, which are generally painful. The diagnosis of this tumor from ovarian cyst, which is also painless, and of slow growth, can only be made by the history of the case, the general symptoms, and conjoined manipulation. In ovarian cyst the swelling will have been first noticed in the iliac fossa. Now, myofibroma of the uterus is usually directly in the center, behind the bladder. Sometimes, if upon the anterior wall of the uterus, there will be great difficulty in retaining the urine in the bladder on account of pressure. A myomatous tumor sometimes becomes affected by cystic degeneration, and then we have fluctuation, so that it will be very difficult during the life of the

patient to make an accurate diagnosis. These tumors frequently project in the cavity of the womb, springing from the interior wall (intramural). In such cases removal by instrument is practicable. This is best done by enucleation, a process very similar to taking an onion out of its skin. Various enucleators have been invented, the number of which is a very good sign that there is still room for improvement. Professor Thompson has invented a spoon saw. To reach the tumor, the cervix must be dilated until the cavity of the womb can be reached with ease. Dr. Yarrow has an enucleator which is a claw-shaped spoon with a cutting edge. It is passed into the tumor, which is gradually gnawed away. Emmett had one like a thimble, and the operation was done entirely by manipulation with the finger. Morcellement, or removal by pieces, originally recommended by Péan, is occasionally practised. In case of uterine myoma, where there is great hemorrhage, and the recurrent periods are characterized by menorrhagia and great ovarian pain, it has sometimes been found necessary to perform Tait's or Battey's operation for removal of the ovary. It is well to bear in mind that menstruation does not immediately cease on removal of the ovary, even when the Fallopian tubes have been removed.

When these myomata are attached to the external wall of the uterus and the connective tissue to such an extent that they gradually crowd out the muscle cells, and become in time true fibromata or fibroid of the uterus, the treatment has always been very unsatisfactory. The

treatment by electrolysis according to the method of Apostoli is still *sub judice,* but as between that method and the more heroic one of hysterectomy, prudence would indicate first a trial of the former, leaving hysterectomy for the *dernier ressort.*

But the operation of hysterectomy has been so much improved in its technic that it has been robbed of many of its terrors, and has become a very common operation.

Myosarcomata are composed of muscle cells and the round-celled sarcoma; they are mostly found in the kidney and testicle and are very frequent in young children.

NEUROMA.

Neuromata are composed entirely of nervous tissue. Now, do n't make the mistake of calling the fibrous tumor or fibroma which occurs in the nerve-shaft a neuroma. You should make the broad distinction that the neuroma proper is composed of nervous tissue. In speaking of fibroma, I told you that there was a tumor which developed upon the nerve itself which was very painful and essentially a fibroma,—that is, fibrous "neuroma" in which the nerve-fibers may be seen unchanged passing through the mass of hypertrophied connective tissue or spread out over the surfaces of the tumor,—but it differs absolutely from true neuroma, which is composed entirely of nerve structure. This neuroma (bulbous nerve) occurs

most commonly after amputation when the nerve is cut across. The Pension Office records are full of cases where the pensioner is unable to wear an artificial limb on account of the great pain or neuralgia in the stump. This is usually due to enlargement of the nerve from neuritis. Of course, it is highly sensitive. There is usually but one available remedy—excision of the neuroma, which will generally cure the patient. Sometimes it may be practicable to divide the nerve above the tumor.

PLEXIFORM NEUROMA.

Occasionally the nerve filaments are spread out over a considerable area of the cicatricial tissue about the end of the bone in the stump, and in such cases these irritable stumps may sometimes be very effectually treated by dividing all the tissues to the end of the bone-stump. Neuromata never recur after removal. Irritable stumps may frequently be prevented by taking care during the amputation to pull the nerve out and divide it as high up as practicable.

Neuroma may also be caused by *bruises*. Professor Kleinschmidt had a case in this city a few years ago, in which I was called to make an operation, where the supra-orbital nerve had been wounded. A man had been struck by a beer-glass on the supra-orbital nerve, finally resulting in most agonizing recurrent attacks of neuralgia at the seat of the injury. On examination it was found that the eyebrow had been badly torn. A swelling of the size of a lead pencil could be felt in the cicatrix. A longi-

tudinal incision was made at the margin of the orbit, the lid drawn down, and the nerve exposed. It was flattened and spread over a considerable surface, three times its normal size. It was removed as far as possible; the pain disappeared, and has never returned. So far as I know, that is the general course of neuroma proper. Where we have facial *tic*, which is a disease of the dental nerve, sometimes of centric origin, due to ganglionic changes, a resection of that nerve does not cure the patient, because it does not appear that there has been an increase of nerve-tissue at the point where the pain is most acute. It seems to be an inflammation of the entire nerve-sheath, so that removal of a section of that nerve, while affording temporary relief, does not cure the disease.

In *tic douloureux*, the removal of a section of the inferior dental nerve will usually cure the patient for five or six months. After that it recurs, though some cases are on record where the patients have been free from pain for two years; but I think the invariable history is that it returns. Excision of the Gasserian ganglion has been performed by many operators. Simultaneous section of the supra-orbital, infra-orbital, and inferior dental nerves, may sometimes obviate the necessity of Gasserian removal.

ANGIOMATA.

Angioma is a tumor originally composed mainly of newly-formed blood-vessels, or of blood-vessels with newly-formed elements in their walls. We have the sim-

ple angioma, the capillary, venous (cavernous), arterial, and nevolipoma. The names as given in the classification will give you an indication of the pathology of that form of tumor. Simple angioma is an enlargement of all the blood-vessels of the part constituting the tumor. Cavernous angioma is applied to that form where the vessels are greatly dilated—the form usually taken on by nevus, or mother's mark. The subvarieties of cavernous are arterial, venous, and plexiform. The simple angioma is a vascular tumor, from which comes the term telangiectasis. The common seat of the angioma is the face and neck. You may often see patients on the street with the simple variety, the growth spreading over the entire cheek or any part of the skin of the face. They are best treated by subcutaneous ligation. They are also treated by cauterization and by electrolysis. Angiomata are occasionally co-existent with sarcoma. A sailor came to me, February 22, 1877, having an immense angiosarcoma directly between the shoulders, over the spine. It projected considerably beyond the surface, and was congenital, but lately had given him some pain by reason of its increased size. I passed a needle directly through it, with a double ligature, in one direction; and another at right angles, also armed with a double ligature. The ends were then cut, and the tumor tied in four sections. It came off in a few days, the cicatrix healed, and the man apparently recovered. After I left the station I was informed that the man returned in a few weeks with an immense sarcomatous growth in the

axilla, of which he finally died, so that the prognosis after removal of this tumor is not always favorable.

The cutaneous nevi on the face and other parts are best removed by the red-hot needle thrust into them subcutaneously, cauterizing with the galvanic needle from an eight- or ten-cell battery. When the eschar is formed by the cautery, you must allow it to become perfectly hard and dry. Electrolysis is a favorite method of treatment. The operation is performed as follows: * "One or more steel, platinum, or iridoplatinum needles are connected with the negative pole of the battery, and if the nevus be large, one needle or a charcoal point with the positive pole; both needles are introduced at the same time into the growth, and allowed to remain in the tissue for a few moments until gas bubbles ascend through the orifice, a clot forms, and the spot assumes a bluish-white color. The negative needle is first removed. The current being reversed, the positive becomes the negative needle, and is easily removed."

The still more superficial forms are often treated by subcutaneous ligation, the knot known by the English surgeons as Fergusson's being that usually employed.

Then there is the linear scarification, done by making lines of scarification in one direction, and then crossing them at right angles. Then there is the puncture. A number of needle-points are thrust directly into these surfaces. Sometimes vaccination has been used to destroy

* Shoemaker, "Diseases of Skin," p. 48, first ed., 1888.

these tumors where the patient has not been vaccinated. The virus is inserted directly into the angioma, and a cure is said to result.

Where the area covered by the tumor is small, the whole may be excised without undue hemorrhage, by keeping the knife in the sound tissues and lifting the whole mass from its bed.

FIG. 7.—PLEXIFORM ANGIOMA.—(*Hamilton.*)

PLEXIFORM ANGIOMA.

This is an arterial angioma consisting of interwoven arterioles which gradually enlarge, until the whole mass consists of pulsating sinuses. It is sometimes called "cirsoid aneurysm" or "racemose aneurysm." It bleeds

very easily on the slightest attempt at interference, and its surgical treatment is unsatisfactory. When situated over the scalp, the blood-vessels frequently communicate with the arteries of the diploë, and on removal the blood gushes from a vessel coming from within the cranium. In a case of this kind, ligation of the external carotid and temporal fails to stop the growth. The best prospect of success is attained by gradual and successive ligation of portions of the tumor.

LYMPHANGIOMA.

The lymphatic nevus has much the same appearance as the angioma proper. It consists in the formation of varicose lymph-vessels, at first tortuous and then cavernous, constituting a "lake" of dilated lymphatics. The *macroglossia* of cretins is due to lymphangioma of the tongue. Lymphangioma is most frequently seen in the axilla, the groin, the perineum, the tongue, the lips, and the vulva.

(*a*) *Cystic Lymphangioma.*—This is congenital also, and is characterized by an aggregation of cysts of variable size containing lymph. The cysts of the branchial clefts and of the perineum at the raphe, which contain lymph, are of the same character; that is to say, they differ from the single cyst. These lymphangiomata are necessarily polycystic.

The diagnosis of lymphangioma from angioma may be always made by puncture and withdrawal of the fluid.

(*b*) *Hemolymphangioma* is that condition in which

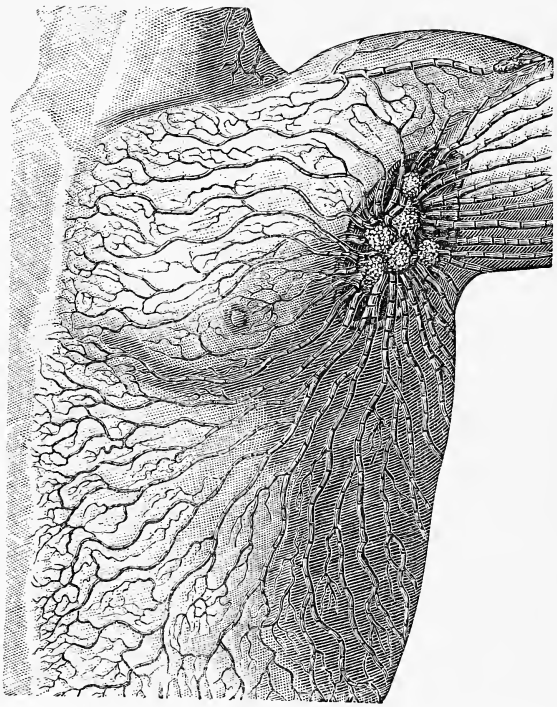

Fig. 8.—Lymphatic Glands and Vessels of the Cavity of the Axilla.

the blood-vessels are also dilated, thus constituting a mixed tumor.

The treatment should always be *excision*.

LYMPHADENOMA (Lymphoma).

This is the lymphatic tissue tumor, and usually malignant. These are neoplasms of the lymphatic connective tissue. Now, this tissue is found in every part of the lymphatic glands, and also in the Malpighian corpuscles

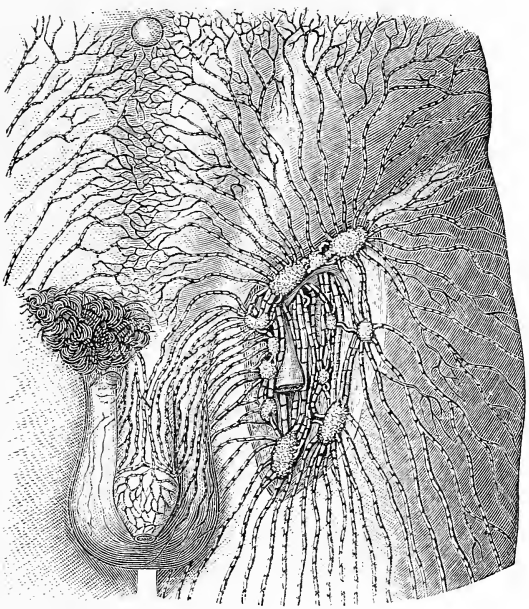

Fig. 9.—Lymphatic Glands and Vessels of the Inguinal Region.

of the spleen, in Peyer's patches, the glands of Lieberkühn, the thymus gland, and the glands of the pharynx. You will please recall that the lymphatic system is composed of glands and lacunæ, or lymph-spaces, and fibrillæ; these last are the connective tissue of the lymphatics. The fibrillæ form a net-work, and between the meshes of

the net-work are the so-called corpuscles. Lymphadenoma would seem to be a hyperplasia or outgrowth, or proliferation of normal lymphatic tissue. In this disease, known as Hodgkin's, the lymphatic glands throughout the body are infected. Lymphadenomata are usually non-malignant, but epithelial or round embryonic cells are sometimes infiltrated from the adjoining tissue, and the more rapidly they proliferate, the more malignant the tumor. Sometimes they are simple hyperplasiæ —non-malignant. It should be remembered that there is some variation in lymph-tissue structure in health, but when the cells are atypical then they become malignant. The cells are like those of small round-cell sarcoma. Lymphoma of the mammary gland is as fatal as any carcinoma. In Hodgkin's disease the spleen is found to be diseased in four-fifths of the cases. As the disease advances, there is leukocythemia; secondary changes in the liver are frequently observed. There is a form which contains round cells, and, owing to the character of the cells and the stroma, some consider it a sarcoma of the lymphatics, and others term it lymphosarcoma.

Lymphadenoma is characterized by clinical differences according to the primary seat of the affection. Thus we have *intestinal* lymphadenoma, *osseous* lymphadenoma, and *cutaneous* lymphadenoma.

The microbic theory of origin has been advanced by Auspitz and Rindfleisch but remains *sub judice.*

Treatment.—The treatment consists in the injection of arsenic—either arsenic iodid or the Fowler's solution. Operative treatment is useless.

LECTURE V.

PAPILLOMA AND ADENOMA.

PAPILLOMA.

a. Wart (squamous papilloma).

b. Columnar papilloma (villous growths).

c. Condylomata.

d. Urethral caruncle.

Quenu denies to papilloma a place among neoplasms, as they are caused by specific irritation, either septic or parasitic; but I shall continue to class them here, although, strictly speaking, we must concede the truth of Quenu's position.

The papilloma consists of hypertrophied and branched papillæ, and always occurs in one of the three surfaces, cutaneous, mucous, or serous. The frequency with which papillomata are transformed into epithelioma is known to all clinicians; hence papilloma of the face should always be extirpated, either by knife or actual cautery.

WART.

The first one of this variety is the common wart,—the so-called verruca vulgaris,—which is simply an enlargement of the papilla. There are various forms of them, such as the verruca senilis, which is the wart of old peo-

ple, usually situated on the back, and highly pigmented; verruca filiformis, a very small filiform wart, $\frac{1}{8}$ to $\frac{1}{2}$ of an inch in length, painless, and looking much like a piece of thread projecting from the skin, and which can sometimes scarcely be detected except by attempting to pull it off; a flat form, called verruca plana; moist warts, from which a constant secretion is produced. The cause of the wart is not known. Virchow states that anatomy bears out the statement that it is simply an enlargement of the papilla. Sometimes they disappear spontaneously. This fact is taken advantage of by charlatans and so-called "cancer doctors," all forms of warts being called cancers, and subjected to all sorts of cauterizations, and among the negroes to voodooism. The child's remedy of a pencil-mark around the growth, ointments, and a variety of applications are in popular repute as wart cures. Some are amusing, and a recital of them would make an interesting chapter. Warts may be treated by snipping them off with scissors, or cauterizing with nitric acid. The mucous tubercle is another form of papilloma, being an enlargement of the mucous papilla. Sometimes it takes on softening and general cystic degeneration, and in that way the duct becomes obstructed, and we have a mucous cyst resulting from an original verrucous growth.

COLUMNAR PAPILLOMA.

This is the villous growth that is frequently found in the bladder, and less frequently in the rectum and the

pelvis of the kidney. Those in the bladder are usually attended by periodic hemorrhage; shreds of the growth may often be found in the urine, and, although they are so soft as not to be felt with a sound, the passage of a bougie is always followed by hemorrhage. The cystoscope may also be used in their detection. Suprapubic cystotomy is indicated in these cases as the easiest means of reaching the base of the tumors and scraping them out with the curet.

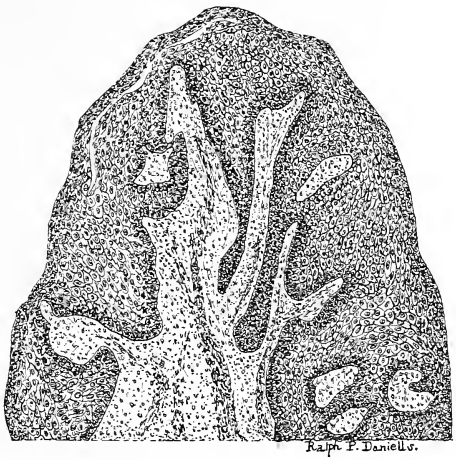

Fig. 10.—Condyloma of Anus.—(*From Clinic of Prof. J. B. Hamilton, Rush Medical College.*)

CONDYLOMATA.

The *condyloma* is a specific form that is deserving of considerably more attention. There is a general predisposition to the formation of papillary growths in the internatal fold, in the groin, and in fleshy females where

the mammary glands hang over the chest, and anywhere where mucous or cutaneous surfaces rub against each other. The condyloma is usually due to a specific cause. We find it on the glans penis, the corona glandis, the vulva, and at the verge of the anus. There is a considerable secretion flowing from them, which is highly odoriferous and disagreeable. There is great irritation when it is situated on the glans penis, or concealed beneath the prepuce, and there may be pain, not directly from the condyloma itself, but from the irritation caused to the prepuce and gland. When concealed, it may be mistaken for gonorrhea or a concealed ulcer. The operation for phimosis will reveal at once the cause of the difficulty; or, by using a pair of forceps as a speculum, the prepuce may be separated so that the growth may be seen. The treatment is excision with the knife or cautery, or, as I prefer, the actual cautery.

URETHRAL CARUNCLE.

The next form is *urethral caruncle.* When this is large, it constitutes a very serious affection. It consists of enlarged papillæ situated at the meatus urinarius of the female, and sometimes entirely within the urethra. Anatomically these structures are found to be very richly endowed with nerve filaments and blood-vessels, on account of which they are very painful and bleed very freely. Not only that, but they sometimes form a considerable obstruction to the flow of urine, making urina-

tion painful. Cases are recorded where carunculi have attained the size of a goose-egg, though ordinarily they are the size of a pea. When they are found in the urethral canal, instead of the margin of the meatus, they give rise to greater obstruction to the flow of urine, and necessitate the passage of the catheter—a very painful operation, which may be relieved by the previous use of a six per cent. cocaine solution.

The prognosis is good if single, but if multiple they produce persistent neuralgia of the membranes, so that the removal of the caruncle does not stop the pain, and you must give a guarded prognosis in such cases.

Treatment.—To remove them, you may use the ordinary polypus snare, or excise them with scissors, or use the thermocautery. If situated in the canal, it will be necessary to dilate the urethra and apply a stick of nitrate of silver or fuming nitric acid, by means of a glass rod, to the stump of the tumor. For the persistent neuralgia following these carunculi, forcible dilatation of the urethra with forceps is the best remedy.

ADENOMATA.

Adenoma is a gland tumor—composed of glandular structure. We may find adenoma in any gland of the body, from the pineal down to the lymphatics. It is proper to say, however, that in the gland tumor, or adenoma, there is a variety of mixed forms: adenosarcoma,

which is produced by the admixture of sarcomatous cells with the gland structure proper; adenomyxoma, which is a gland tumor with mucous cells intermixed. Under our classification the mucous polypi were formerly classed as adenomata, because they were supposed to be a hypertrophy of the mucous glands, but it is now taught that they are really fibromata. They originate, according to Hamilton, of Aberdeen, "in the fibrous tissues of the mucous membrane, and grow in the direction of least resistance; namely, into the cavity which the mucous membrane lines. It pushes the epithelium in front of it, and insinuates itself between the glands of the membrane." They may grow in any part of the mucous membrane. They are quite soft to the touch; sometimes translucent; sometimes pale or opalescent. This is the ordinary polypus of the nares, the uterus, and the external auditory meatus, and has, therefore, been changed in the present classification. The diagnosis of the adenoma proper is very difficult. It is especially so when the adenoma is in an inguinal gland, when the question whether the disease is due to syphilis or specific infection of some kind will arise. The only means of diagnosis in such cases is the history of the case, and if the patient is inclined to prevaricate, you will be obliged to have recourse to anatomic considerations. We should remember that the lymphatic ducts coming from the penis enter glands *above* Poupart's ligament.

Differential diagnosis between adenoma and cancer is very important and very difficult. So far as the patient

is concerned, the remedy will usually be the same—extirpation. But it is a pleasant thing to be able to tell the patient that the disease is non-malignant. Now, in adenoma of the mammary gland you should always treat it like cancer, for fear of carcinomatous proliferation.

When the epithelial lining of the glandular tubules becomes distended with fluid, then it is called "adenocele," or cystic adenoma.

When we find the connective-tissue fibers imperfectly developed (embryonic), we term it adenosarcoma. When the stroma contains mucous tissue, we term it adenomyxoma.

LECTURE VI.

SARCOMA.

The neoplasm known as sarcoma is one of the most important of tumors, whether we consider its variety of forms, its effects on the patient, or the attention that must be given by the surgeon. Among the older writers, nearly all malignant and fleshy tumors of whatever character were included among the sarcomata, and I am not sure but you may conclude, when considering the number of tumors that, having separate names, are yet classed among them, we are fast returning to the ancient practice. It may occur at any age, but is rarely seen in the aged. It is very frequently encountered in infants. The initial growth of the sarcoma is from the connective tissue, in whatever organ or tissue the tumor may be found; but there is a cellular structure in the sarcoma in addition to the type-cell of the matrix from which it sprung. The cells are infiltrated between the fibrillæ of the connective tissue. The starting-point may be normal connective tissue, or that of another tumor, such as myoma, fibroma, or cyst. The sarcoma springing from the connective tissue then becomes a myosarcoma, a fibrosarcoma, or a cystosarcoma; and that is what is meant by the sarcoma-

tous transformation. The cells of a sarcoma are the formative cells of connective tissue, but they never complete the formation; hence they are termed embryonic. This holds true of all varieties of sarcomata; and these embryonic cells are constantly reproduced in the proliferation growth of the tumor. There are three general varieties of sarcomata, although our nomenclature gives ten subdivisions. The first has a simple, or round cell, and is the most malignant; the next has the so-called giant-cell; and the remaining one the spindle-cell. The giant-cells have also been termed myeloid, because they are like the protoplasms found in the marrow of fetal bones. They are the largest of all human cells. They sometimes have hundreds of these nucleated cells; these may have a great many nuclei. The sarcomata are very vascular. There is a variety of sarcoma, characterized by an excessive development of blood-vessels, called angiosarcoma, or erectile sarcoma. Sometimes fat-cells grow out of the other cells, producing fatty degeneration, which is more apt to take place in spindle- than in round- or giant-cell sarcoma. It differs in malignity in the character of the cell, the round cell being more, the spindle-cell less, and the giant-cell least, malignant. It has a progressive tendency and, if allowed to remain and neither fatty nor calcareous degeneration occurs, it destroys life. The method of recurrence of this tumor after extirpation, constitutes one of the observed differences between it and carcinoma. A cancer, when removed, recurs, but not necessarily on the site of the old

tumor; whereas sarcoma recurs nearly always on the exact site of the original tumor. In carcinoma it is more

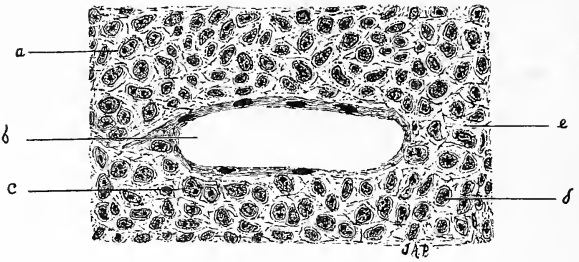

FIG. 11.—ROUND-CELL SARCOMA. OBJ. No. 7.

a. Sarcoma cell. *b*. Blood-vessel. *c*. Sarcoma-cell nucleus and nucleoli. *d*. Nucleus of sarcoma cell containing single nucleolus. *e*. Stroma.

apt to occur in what is termed the secondary form, by making its appearance in some of the internal organs, the nearest lymphatic gland, or even some point quite removed

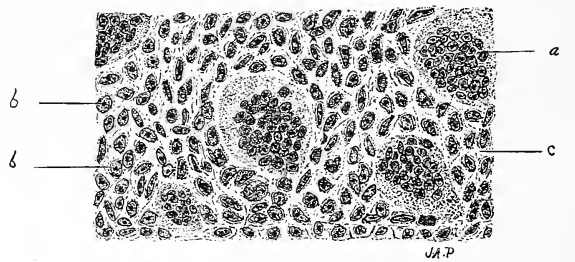

FIG. 12.—GIANT-CELL SARCOMA. OBJ. No. 7.

a. Giant-cell with nuclei. *b, b*. Mononuclear sarcoma cells. *c*. Stroma.

from the original infection. The lymphatic glands are not always affected in sarcomata, except those in the path

of circulation from the tumor to the center of the lymph system; there is no "cancer juice." The sarcomatous cells also form continuous portions of tissue; whereas in carcinoma the reverse of all this occurs. There is great pain, the lymphatic glands are affected, and there is "cancer juice." The cells do not form part of the tissue. There is a difference in the malignancy of sarcoma, according to its site. Sarcoma of the testicles, for some unknown reason, is more liable to destroy life quickly

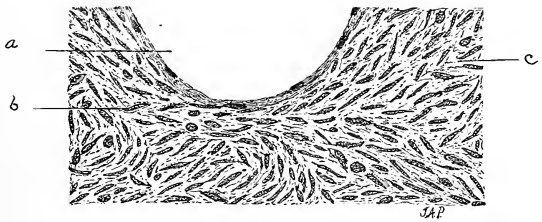

FIG. 13.—SPINDLE-CELL SARCOMA. OBJ. No. 7.
a. Blood-vessel. *b*. Sarcoma-cell nucleus. *c*. Stroma.

than sarcoma of the ovary; why this should be, is not understood. Then we have sarcoma of the hand, which will surely destroy life unless amputation is performed.

A medical officer of the army called upon me some years ago, having a diffuse swelling or thickening of the hand. It showed more externally than in the palm. It was discolored but painless, and I regarded it as not carcinomatous. A puncture was made, and some of the fluid which flowed out was submitted by the officer to the late Surgeon Woodward for microscopic examination. He found the round-cell sarcoma. The patient was then

on leave of absence, and died about four months thereafter. The swelling was not at that time very great, and there was no pain.

There is a melanotic or pigment sarcoma, having its seat mostly in the skin and in the choroid of the eye—sometimes in the lymphatic glands, but it may be found elsewhere.

A case of melanotic cystosarcoma was under my care a few years ago, in which the tumor recurred three times after extirpation. In this case the mammary gland of the right side was alone affected, and the tumor recurred at the site of operation. The patient finally died with all the symptoms of general anemia accompanying the sarcomatous cachexia.

The giant-cell sarcoma, or so-called myeloid, has its common seat in bone, although it may appear in the mammary gland. There is a characteristic difference between all the sarcomata and adenomata of the mammary gland. In sarcoma, upon the fresh-cut section the surface will present little pink vascular points of different shades of color upon the white section surface, which afford a pretty ready macroscopic means of distinguishing sarcoma from adenoma by the eye, for in adenoma, on the contrary, there is only the usual appearance of glandular structure.

It seems to me sometimes that with our present methods we are losing the delicate visual power which characterized our surgical masters of twenty-five years

ago. Many of them were able, by simply looking at a section of a fresh specimen, to immediately classify it properly. The late Prof. J. S. B. Jackson, of Harvard College, possessed such acute visual sense that his opinion of a tumor was rarely reversed by subsequent microscopic examination. You should always examine a tumor immediately after removal, so that you may become expert in this way.

The following table from Woodhead will be useful to you in making your comparison between sarcoma and carcinoma:

DIFFERENTIAL DIAGNOSIS (*from Woodhead*).

	SARCOMA.	CARCINOMA.
1. Origin, ...	Entirely mesoblastic.	Meso- and epi- or hypoblastic.
2. Stroma, ...	Intercellular. Does not form alveoli only.	Forms alveoli, which communicate with one another, and surround masses of cells.
3. Cells, ...	Granulation tissue or embryonic cells, not epithelial (shape various).	Epithelial, shape and size various. Distinct nuclei and nucleoli.
4. Intercellular substance.	Present.	Absent, or merely fluid.
5. Vessels, ...	Embryonic in character. In contact with the special cells of which tumor is composed, and formed by modification of them.	Well developed, entirely contained in the walls of the alveoli. Not in contact with the cells except in very rare cases.

	SARCOMA.	CARCINOMA.
6. Spread, ...	By blood-vessels.	By lymphatics, except in the latter stages, when they may also spread by blood-vessels and then very rapidly.
7. Malignancy, . .	Great.	Greater.

MELANOTIC SARCOMA (Pigmented Sarcoma Melanoma).

This is the pigment tumor of the meninges. It is to be carefully distinguished from melanotic cancer, which is a pigment encephaloid (medullary cancer). Now, this melanoma occurs primarily in the pia mater and in the choroid. It occurs also in the fascia, the membranes of the spinal cord, and in the nervous centers of the body. In addition to the choroid we may find it in the iris, in the conjunctiva, and the skin. In fact, melanoma occurs most frequently in those tissues in which pigment is the normal constituent. Cornil and Trasbot found this form of sarcoma forty-seven times in the skin, fifty times in the eye, and seventeen times in the internal organs. There is hypertrophy of the pigment glands, and hyperplasia of the pigment cells. When it contains spindle-cells it is then the most malignant of all the sarcomatous growths.

PSAMMOMATA.

Psammoma, the brain-sand tumor, so called because it is apparently composed of a granular, black substance called brain sand, is found principally in the choroid

plexus and in the dura mater. This black cerebral sand is also found in the lymphatic glands, or complicating other tumors by forming in their substance, and it may occur in various forms. It is now known that these tumors contain spindle-cells, and are hence classed among the sarcomata; Woodhead called them "angiolithic sarcomata." Sometimes, when they grow very large on the choroid plexus or dura mater, they produce pressure, and then the usual cerebral symptoms will manifest themselves. The anatomic relations of this tumor make it inoperable.

Prognosis and Treatment.—Whatever the form of sarcoma, it should be remembered that it is very malignant, and that if recurrence is to be prevented it must be operated upon early, and one must be very guarded in making promises.

You must not allow your patient to take any chance as to the malignancy of the disease, bearing in mind that unless fatty degeneration, calcification, or ossification occurs, the disease will steadily progress and the life of the patient be destroyed. These natural terminations are so rare that they may be almost omitted from your calculations. When the bone is involved, constituting osseous sarcoma, amputation will almost invariably be required. In regard to amputation, the rule is to amputate the whole bone involved, or the tumor will reappear in the stump. Careful examinations should be frequently made after operation, and on the appearance of any neoplasm it should be promptly extirpated, passing the

knife in healthy tissues entirely outside the neoplasm. Sarcoma involving the frontal sinus or nasal passages is almost invariably fatal, and the recurrence after extirpation is very rapid. One should not weary, however, of operating upon these secondary growths in other situations, as in many cases the patient may be finally cured. Cases have been reported where the patient has recovered when as many as twelve operations have been performed.

LECTURE VII.

CARCINOMA.

I have long been of opinion that the true origin of carcinoma must be found through a study of cases in their incipiency. We usually see carcinoma after it is fully developed, but I firmly believe that some one having leisure and opportunity will make examination of a sufficient number of cases to establish the character and conditions of this neoplasm from the first point of departure from the normal structure to the completed carcinoma.

The term cancer is one that has been applied to so many different forms of tissue and so many different forms of tumor as to have lost its significance in a scientific sense. Sometimes adenoma (which, as you know, is a simple hyperplasia of the glandular tissue) has been called cancer, because it occasionally assumes cancerous transformation. Sarcoma has also been called a cancer, hence the present tendency among pathologists to discard the term cancer, and employ always the word carcinoma to differentiate it from other malignant forms. Carcinoma prevails in all parts of the world; there is no geographical region exempt, nor can you find any particular region that is specially favorable to the formation

of cancer. In England alone, from 1838 to 1842, there were 11,662 persons who died from carcinoma. Of these, 8746 were women and 2916 men. In the United States census of 1870 there were recorded 6224 deaths from carcinoma; of these, 3923 were females and 2301 males; making about one in thirty in that census report. The report of the Census Bureau for 1880 shows 13,068 deaths from carcinoma, of which 4875 were males and 8193 females. The same report for 1890 shows 18,536 deaths, of which 6958 were males and 11,578 were females. This gives a total for three census years of 37,828.

In the Marine Hospital reports, the proportion of deaths from carcinoma is 1 in 70, occurring among adult males exclusively. It is more prevalent in women than in men, because the larger number are found in the mammary glands and the uterus; so when you exclude carcinoma of the mammary gland and of the uterus, the death-rate is reduced very materially. There have been at different times great disputes as to the particular cancer-cell that is to be found in each special variety of carcinoma. There is no longer belief in any specific cancer-cell; that is to say, the cancer is now believed to be a growth of epithelial tissue which has grown out of place. You will not be far wrong if you view all carcinomata as one disease, the alleged subdivisions as many of them arbitrary, and all of them founded on clinical differences, some of which may be accidental. Hamilton's (of Aberdeen) definition of cancer is "a neoplasm formed of any tissue whose fibrous interspaces and

lymphatic vessels are infiltrated with actively proliferating epithelial cells." Carcinoma may be developed in any part which has epithelial tissues, or any organ of

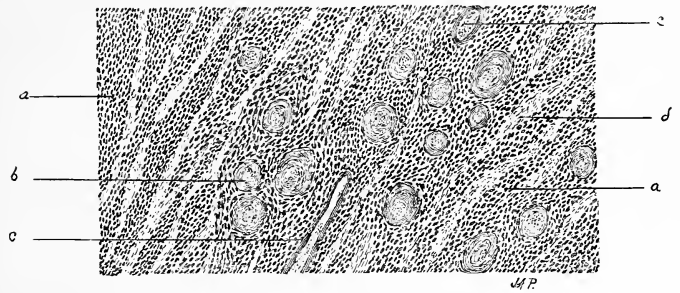

Fig. 14.—Stratified-Cell Carcinoma. Obj. No. 3.

a, a. Rows of carcinoma cells. *b.* Carcinoma pearl. *c, c.* Blood-vessels. *d.* Stroma of fibrous tissue.

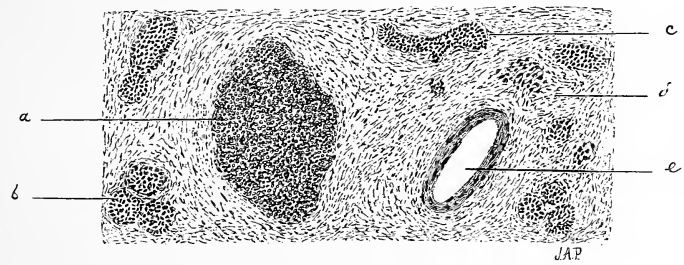

Fig. 15.—Glandular-Cell Carcinoma. Obj. No. 7.

a. Glandular arrangement of carcinoma cell-nests. *b.* Smaller carcinoma cell-nests. *c.* Longitudinal section of carcinoma cell-nest. *d.* Stroma. *e.* Artery.

the body which has epithelial tissue in its substance. Now, we distinguish carcinomata in general from other tumors of the body by what we term the alveolar structure, wherein the so-called cavity or cell is formed. I

show you here a diagram from Cornil and Ranvier, which exhibits this alveolar structure very clearly. We find that these alveolar spaces are filled with epithelial cell infiltrations. I say infiltrated, because they are not naturally there; they do not belong to the part. All these cells have nuclei; not, however, in the same manner as the giant-celled sarcoma. There is usually a single nucleus to each cell. This alveolar structure (pure fibrous tissue) constitutes the stroma of the cancer. It contains the blood-vessels, and grows at an equal pace with the young epithelial cells. These cells keep pushing on and extending into the tissues, forming cylinders, or what the charlatan cancer-men call the "roots" of the cancer. This is simply a prolongation. In these structures there is no capsular or limiting membrane. In speaking of lipoma I told you that fatty tumors, hygromata, and cysts were encapsulated by dense fibrous connective tissue, and this when cut down upon would show a white shining surface, and that the tumor itself does not directly enter the tissue. Now, in carcinomata there is no capsule. These prolongations enter directly into the tissue. At the outset all these growths of carcinomata are distinctly local. That is not the case later on, when we shall speak of cachexia. All the carcinomata are malignant, for they sooner or later destroy life. The degree of malignancy is different in the different forms of tumor, and of that I will speak in giving the varieties.

Although I say that it is not primarily a disease of the

blood, it is a well-known clinical fact that the child of a cancerous parent has a predisposition to the formation of cancer—that in a family where one brother or sister has a cancer there may be others similarly affected. At first blush you will say that is an evidence of blood infection; but if you recall what I said in my opening lecture, about the theory of Cohnheim that all tumors are congenital, you will see what is now meant by the term hereditary,—viz., that there is some local defect causing an atypical cell, which may remain dormant or latent. Our classification recognizes five varieties of carcinomata with seven sub-varieties, but at least four of them should not be so classed; thus, the *medullary*, or *encephaloid*, is a carcinoma like the type, except that the stroma is very slight, the alveoli large, and the cells are greatly increased. It is doubtful if a true carcinoma of bone exists. There is, of course, an osteoid sarcoma, but as there are no bone cells in it, it is a sarcoma springing from the periosteum.

The **colloid carcinoma** consists in distinct alveoli filled with a gelatinous mucoid mass, especially common in the ovary and the abdominal cavity, sometimes called "alveolar cancer."

EPITHELIOMA.

In *epithelioma* we have the true carcinoma which constitutes the type—epithelial cancer. Epithelioma is slower in growth than the scirrhus, which is classed in the

nomenclature as "atrophic cicatricial scirrhus," and in certain circumstances, when extirpated early, does not recur. Indeed, it is probable that none of the carcinomata would recur after extirpation if it were possible to make a diagnosis and operate upon them in their incipiency.

FIG. 16.—EPITHELIOMA.

Epithelioma of the lip may be taken as a type of this class. It is one most amenable to treatment. The disease occurs in the beginning as a small crack or fissure in the lip, and gradually extends until the whole lip, and sometimes cheek, is involved. It is at first not very pain-

ful, but becomes so as the disease progresses; hemorrhages are frequent. After an apparently thorough extirpation it may recur, but usually at, or adjoining, the original site; whereas in the scirrhus the recurrence may be in the nearest lymphatic gland, or in some internal

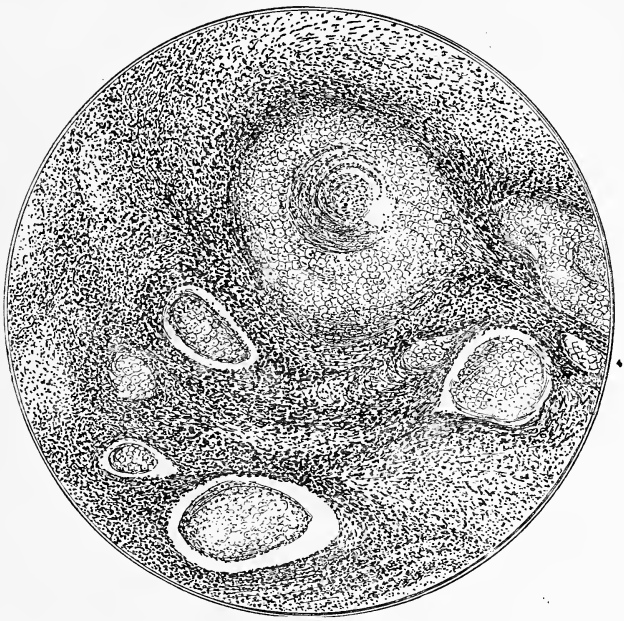

Fig. 17.—Epithelioma.

organ. It should be an invariable rule in extirpation of all the carcinomata, as in sarcomata, to keep clear of the diseased structure, carrying the knife in sound tissues. Lack of this precaution will render this operation unavailing in preventing the recurrence of the disease.

My personal experience leads me to believe that carcinoma of the intestine is equally safe from recurrence if operated upon before the mesenteric glands become involved.

M. Ruffer, the director of the British Institute of Preventive Medicine at London, in "Traité de Pathologie Générale," Bouchard, 1897, has furnished a remarkable paper concerning the parasites of the malignant epithelial tumors.

He began his study by examination of the fresh specimen, the results of which examination were reported to the International Medical Congress at Rome in 1894. With the aid of high power and strong illumination he found in the interior of certain epithelial cells, and more frequently in their protoplasm, round spaces which at first seemed to resemble vacuoles. These spaces are surrounded with a double membrane, containing in their substance a body difficult to outline with the ordinary light of an Abbé condenser. When the condenser is raised so as to let the light fall a little obliquely, the bodies are seen to be *sui generis*, resembling endogenous or invaginated cells, differing both from leukocytes and degenerated cells. These bodies are characteristic, and invariably contain a small nucleus, sometimes granular and sometimes marked in the center by a clear spot. This nucleus is surrounded by a homogeneous bed of protoplasm, replacing more or less the vacuole above described. These parasites, nearly always immobile, are sometimes subject to very slow movements of oscillation.

The usual methods of staining bacilli will not show these microbes; *basic* colors of anilin will not stain them, and acid anilin colors must be used. The parasite is, therefore, as Ehrlich has stated, oxyphile and not basophile. It neither resists heat nor drying, and is very delicate. To make a good preparation Ruffer raises with a scalpel a little of the cancerous juice and places it on a slide; it is then mixed with a drop of color, and, having taken care to mix it thoroughly, he places on a cover-glass and lutes its edges with vaselin or paraffin. The specimen thus prepared will keep for study during forty-eight hours. The color is blue-methylene, to which a few drops of green-methylene have been added, with sufficient acetic acid to make the solution feebly acid. The nucleus of the epithelial cell is colored green, the protoplasm a very pale blue. The nucleus of the parasite, on the contrary, is rose, and its protoplasm pale blue. The parasite is colored with several acid anilin colors; those giving the best results are methylene-blue, eosin, glycerin, and anilin-blue in feebly acid solutions.

In microtome sections the parasite is found only by the most careful preparation, for ordinary methods of fixation and hardening are useless. Müller's, Flemming's, Fol's, and Foa's fluid and alcohol are objectionable, as they either prevent the action of the acid anilin colors or deform the cells by shrinking them. The specimen should be hardened in sublimate solution and then passed through chloroform or xylol. After hardening, the coloration is effected by hematoxylin, cupric

sulphate, and dilute hydrochloric acid. The solutions must be accurately prepared. For the exact formula we must refer to the "Traité de Pathologie Générale," by Bouchard, Volume II, pages 658, 659.

Paget's disease of the nipple is a form of epithelioma which clinically resembles epithelioma of the lip, commencing as a painful fissure at the base of the nipple, bleeding easily, and as it progresses a rapidly growing granulating surface is seen, then by proliferation it extends into and between the acini. It does not recur if extirpated early. Epithelioma of the cervix uteri requires hysterectomy, preferably by the vaginal method.

ATROPHIC CICATRICIAL SCIRRHUS.

In this form of carcinoma the stroma is very dense and firm, and the alveoli small and compressed. I will describe a typical case of mammary scirrhus: A female patient will come to you complaining of sharp lancinating pain in the breast; not infrequently she will have a history of some injury, such as striking the breast on a sharp corner, or being accidentally struck with the elbow, etc., etc. At any rate, on examination of the breast, if the case be not far advanced, you find a painful swelling just beneath the nipple, or at one side of it. This is at first movable, but as the case progresses the nipple becomes retracted more and more, the tumor rapidly grows larger and firmly attached to the periosteum of the ribs; the glands in the axilla be-

come swollen, and the patient's sufferings greatly increase. The pain is not always great; indeed, some patients do not complain of pain in mammary cancer

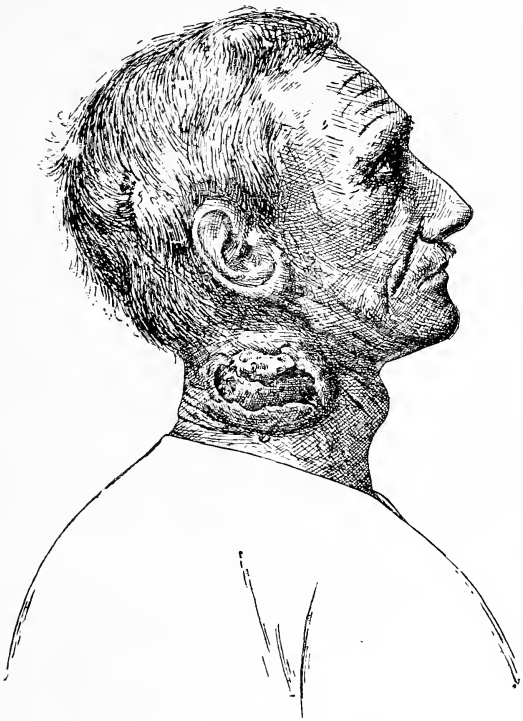

FIG. 18.—CASE OF SCIRRHUS OF THE NECK.—(*From a sailor in Providence Hospital.*)

until the disease is too far advanced for successful removal. She will then have the cachectic appearance, the general indication of anemia; and the more malignant the growth, the more characteristic the cachexia. When

the carcinoma has grown so that the entire mammary gland has become involved, the skin over the tumor usually becomes infiltrated, ulceration sets in, and the patient becomes cachectic and speedily dies. This is the usual course of this form of carcinoma. Males may also have this neoplasm: three cases have come under my personal observation. In other organs the symptoms naturally vary according to the location and the physiologic functions of the organs involved.

RODENT ULCER.

This is a carcinoma of the skin, less malignant than many other varieties, and it occurs in two forms, the superficial and the deep. The first is usually found upon the face, and the second on the lip, penis, scrotum, and back of the hand. In the superficial form the proliferation begins in the sweat-glands and grows very slowly; the epithelial masses then extend into the cutis vera. To the eye the disease commences as a crust or scale, and there is a pearl-colored rim about it; finally the crust is removed by the deeper ulceration, and the epithelium extends into the underlying structures. It is painless, and may last for many years without giving much annoyance or danger, but it constantly spreads until the whole face is eroded. The deep form is more rapid, and cell "nests" or pearls are seen in the growth on microscopic examination of a section. Metastatic nodules are soon found in the adjacent glands.

SQUAMOUS CARCINOMA (Chimney Sweeper's Cancer).

This is a form of the disease almost unknown in the United States, although common in England. It commences as a wart on the scrotum, known as a "soot wart," and gradually extends until there is an extensive ulceration. I do not recall that a single case has ever fallen under my observation.

THYROID CARCINOMA.

This is a rather doubtful carcinoma, although epithelial in character. It appears as a pulsating tumor on the cranial bones, on the clavicle, or vertebræ. The structure is like that of the thyroid body. The thyroid body is enlarged. Cases have been reported by Henry Morris, Cohnheim, Runge, and Dr. Coats.

CYSTS.

The word cyst literally means any membranous sac or bladder containing fluid, but we restrict it to certain abnormal conditions to be hereafter mentioned *seriatim*.

According to the Virchonian classification, the retention tumor is simply a damming up of a duct from some gland, or the retention, in the gland itself, of matter which is there secreted and usually thrown out. In that case

we have a dilatation of the natural sac, and a cyst is formed.

Cysts may be formed in almost every portion of the body, except perhaps in the substance of the lymphatic glands. It is quite probable that this degeneration may take place in all parts of the body, but it is a fact that the lymphatic glands are notably free from cystic degeneration. Billroth says that closed follicles of the lymphatic glands never give rise to cysts, but "any tissue rich in cells may be transformed into a cyst by metamorphosis of protoplasm, or, as others express it, by separation of the mucous substance, through cells, without connection with development of the mucous glands." But the retention cyst proper should only include those arising from distention of preëxisting spaces. Cysts of the acini of glands are called *involution cysts*. These are always small. They are found in the breast, pancreas, etc.

CYSTIC BRONCHOCELE.

This always originates as a minute cyst. It may be as small as a pin-head in the beginning, but greatly enlarges, and finally becomes an immense cystic growth. They extend sometimes entirely across the front of the neck, swelling it and raising the chin. Cystic bronchocele is comparatively easy to diagnose from goiter, because goiter proper is simply a hypertrophy of the thyroid gland—"fibrous" goiter. There is no fluctuation in goiter. In a cyst there is fluctuation. As to the history

of the case, it is proper to say that cystic disease of the thyroid occurs about as often as true goiter in those localities where goiter is prevalent—in some of the valleys of the Alps. Professor Frank Hamilton, in speaking of goiter, said he had occasion to visit Switzerland, and wanted to see why goiter was more prevalent in the Alps than in other localities of Europe. He found it most prevalent in those deep valleys where the sun never shone, where it was continuously damp, where twilight came early and daylight late. The inhabitants were languid and insufficiently fed, so that not only the climate but inadequate food aided in its production.

Let us return to the cystic tumor of the thyroid. Like the other non-malignant tumors of the thyroid body its growth is very slow. It becomes annoying to the patient, not from pain but from pressure. Sometimes when large it presses on the trachea, and then there is difficulty in breathing and in swallowing. The disease begins in a colloid degeneration which progresses until the whole body consists merely of distended vesicles and the fibrous septa. These vesicles, as the distention becomes greater, coalesce and form a large cavity. They contain colloid matter and a syrupy albuminous fluid. Whenever you are in doubt as to the precise character of the tumor, use the exploring needle. One of the oldest forms of treatment is by the seton, originated in the time of Celsus; but it is not without danger, principally from hemorrhage and septicemia. In fact, modern antiseptic surgery practically excludes the seton as a therapeutic measure.

Occasionally a blood-vessel or vein is involved, and the vein becomes ulcerated; then we may have phlebitis and pyemia follow. Tapping is another method of treatment, but not altogether safe, a case having been reported in which rupture into the larynx and pharynx followed. Tapping, followed by the injection of iodin, has been more satisfactory, and injection of carbolic acid was practised by the late Professor Gunn, of Chicago, in cases of cystic goiter, with considerable success.

Incision into these tumors has been practised very frequently, but that, like all other methods, is dangerous, the gland being always vascular. A puncture in any part is followed by hemorrhage, and an incision by very great hemorrhage. The larger the cyst, the more formidable is treatment by incision. If it be treated by incision, it should be tightly packed with iodoform gauze, the sac having been previously washed out with the mercuric bichlorid solution, or tincture of iodin injected. Beck, of Freiberg, prefers a much more radical treatment. Freiberg is a place where more of these growths are reported than in any other place in the world. Beck treated thirteen cases by complete extirpation. Two of the cases recovered after a long and tedious suppuration; eleven died. The dangers of the operation do not cease with the closure of the wound, for it has been found that after the removal of the gland myxedema was apt to follow, and Horsley has shown that there is a close connection between the mental disease and the loss of the gland. But in cystic disease the gland must necessarily have

been previously destroyed by the progress of the disease, so that while the observation of Horsley may hold good in true goiter, it has much less weight in the cystic goiter. But that myxedema is an accompaniment in all cases where the body has lost its function there is no longer any doubt. Electrolysis has been proposed as one of the best means of treatment in these cases. The method of treatment by the electric pole is simply by dissolving the tissue. All that you see is a little greenish fluid about the pole and a bubbling up of gases. In other words, the tissue in contact with the electrode is dissolved into its original elements. It is as near total annihilation of that tissue as you can well imagine. While I would recommend you to use the thermocautery in cases where the whole gland is involved, I prefer extirpation when they are unilateral. It might be well to note, in passing, the occasional success of the treatment of true goiter by the internal use of iodid of potassium and the external use of iodid of lead and electricity. The operation of removing one-half the gland, having at its commencement tied the isthmus, is quite satisfactory in the young. Myxedema does not follow in any case where a portion of the gland is allowed to remain, and I have seen no case of partial extirpation where any serious result followed the operation. Moreover, we must remember that we may control myxedema by the administration of thyroid extract in appropriate doses.

CUTANEOUS CYSTS.

The retention cysts of the skin are mostly found about the face and nose, in the ducts of the sebaceous glands. They appear as little black specks on the face, are called comedones, and are due to the damming up of the sebaceous ducts, and the lodgment of soot or dirt, giving the appearance, upon being squeezed out, of a maggot with a black head. This is a true cyst.

TRACHEAL CYSTS.

The trachea is frequently the seat of cystic tumors. The mucous glands throw out the secretion which, by retention from damming of the ducts, forms the cystic tumor of the trachea.

GASTRIC CYSTS.

The stomach is also occasionally the seat of cystic tumors; the result is hypertrophy of the mucous membrane, a gastritis called gastritis mucosum occurs, and, as a result, polypoid growths follow. At the base of these polypoid growths we have the dilated mucous ducts, which dilations become cysts, which can not be distinguished during life. In the liver we sometimes find similar cysts, supposed to be distentions, being composed of minute bile-ducts, containing bile, cholesterin, and other salts.

PANCREATIC CYSTS.

The pancreas has a cyst of the ducts. They become filled with a secretion—the so-called *acne pancreaticus*, sometimes called pancreatic ranula. Once in a while these pancreatic ducts become filled with a chalky concretion, and if infected an inflammatory process results. Cysts of the pancreas sometimes attain a large size, and are difficult to diagnose from hydronephrosis or other cysts of the kidney.

These consist of cysts of the acini constituting the so-called *acne pancreaticus*, and cysts due to the obstruction of the larger ducts and sometimes the main duct. Senn, who has reported five cases of this cyst, reported one, probably the largest on record, as due to a traumatism by which the duct was lacerated. This was successfully operated upon by opening the cyst, bringing the wall of the sac into the incision, and there fastening it.

Displacement of the pancreas may also cause obstruction of the ducts and resulting cystic disease. In this case there will be present celiac neuralgia.

INTESTINAL CYSTS.

The intestines are occasionally the seat of cystic tumors, produced by the swelling of the ducts of the intestinal follicles. In speaking of intestinal cysts, I have not mentioned cyst of the gall-bladder, due to the formation of a large gall-stone; nor of that due to obstruction in the appendix vermiformis.

KIDNEY.

We have a variety of small pin-headed cysts in the kidney; also in the tubules as a result of interstitial nephritis. These are very small, and can be seen only with the microscope. Finally, in the kidney we may have cysts of the most variable size. We have that peculiar cyst found in the new-born child, *hydrops neonatorum*. In that case it is enormously enlarged. Cysts of the kidney, sometimes very large, often follow chronic inflammation of the organ; they very rarely follow the acute form. Parasitic cysts are common in the kidney.

UTERUS.

Simple cysts of the uterus are formed from the retained matter of the utricular glands. The mouths of the ducts of these glands become entirely closed, and the secretion is retained. Sometimes the entire surface becomes so generally obstructed that we have the acne formation, like that of the small pancreatic cysts.

GALACTOCELE (Milk-Cyst of the Mammary Glands).

It has been frequently taught that abscess of the female breast, following parturition, was usually due to neglect on the part of the accoucheur or the nurse. But I am sure that I have seen these tumors and abscesses form in the mammary glands where every precaution was taken; galactocele formed, followed by suppura-

tion—for that is the usual termination of these cysts of the mammary glands. They arise sometimes by reason of a microbic invasion, accompanied by a rise of temperature, and followed by a closure of the smaller milk ducts; and then, when the milk is dammed up, the gland will be enlarged to a considerable size. There is fluctuation and there will be a severe rigor; the patient shakes as she would with acute ague. Fever follows the chill, and in a little while the tumor is formed; it proceeds through the various grades of inflammatory action, and abscess results, due to inflammation of the connective tissue around the milk ducts from infection. These tumors can frequently be prevented by pumping out carefully the retained milk from the glands, at the same time having the nurse make gentle pressure both on the lower and upper surface of the gland, rubbing the surface toward the nipple; the danger is thus sometimes averted by the removal of the obstruction. Then a sling may be placed around the breast; this has a tendency to prevent any further accumulation, for it will usually be found that these accidents occur when the patient has been allowed to walk around, and then the weight of the gland and the accumulation of milk has a tendency to produce inflammatory obstructions. The treatment does not differ from that of ordinary abscess. It must be evacuated, provided the milk can not be drawn out through the natural ducts.

CYSTS OF TESTICLE.

These are of similar character to those already mentioned.

Spermatocele.—This cyst is analogous to the galactocele in the mammary gland, and consists in the retention of spermatic fluid in the main duct or in the ducts of the parenchyma. The cause may be microbic or traumatic; in the former case the closure of the duct is inflammatory, and in the latter, by adhesion of the duct walls. Monod and Terrillon have classed these cysts according to degrees, whereby the first includes the simple transitory distentions of the main duct and seminiferous tubules, and the second where the dilatation has become sometimes diffuse and sometimes circumscribed, but causing a very considerable tumor and a permanent dilatation. The spermatic cells are diminished in volume and number.

The treatment of spermatocele consists of the evacuation of the cyst contents with the aspirating syringe; then injection with two to ten drops of tincture of iodin. In very large spermatoceles it may be necessary to make an incision and follow by the insertion of a strip of iodoform gauze.

MUCOUS CYSTS.

The *mucous cysts* include mucocele lacrymalis, ranula, and labial cysts.

Mucocele.—Although "mucocele" literally means a swelling formed by obstruction of mucous ducts any-

where, yet the term is arbitrarily applied to the retention tumor of the lacrymal gland due primarily to dacryocystitis.

Ranula.—The next variety of these cysts to which I shall call your attention is the so-called ranula. Exactly why it is called ranula is one of those things past finding out. It comes from "rana," a frog; "ranula," a little frog. The name is a very ancient one, and will have to stand. Columellus, a Roman writer on agriculture (A. D. 42), speaks of a swelling on the tongues of beasts as ranula. We have it as far back as any history of the disease, and several languages have perpetuated it. Although the French usually speak of it as *grenouillette*, "a little frog," they also use the term "ranule." This disease is due to the damming up of the secretion from submaxillary and sublingual glands. This is precisely the same form of cyst that I described to you in speaking of pancreatic cysts. Ranula is sometimes due to a salivary concretion (ptyalith) blocking up some of the ducts or the main excreting duct. When the main duct becomes occluded, there is marked swelling in the mouth, which will sufficiently indicate where the obstruction is located. Dermoid cysts in this region are sometimes mistaken for ranula, but the diagnosis is easy if the history of the case and the fluid from the tumor be carefully examined. Sometimes, indeed, the tumor is pendulous and so enormous that the patient might be said to have what Mark Twain describes as "double chins all the way down to his stomach." In these cases not infrequently both the

sublingual and submaxillary ducts are occluded. In ranula, the patient may have great difficulty in speaking, owing to the pressure of the tongue up toward the roof of the mouth. In old ranulæ, when the cyst contents become inspissated, the tumor is semisolid and may lead to error in diagnosis. Ranula is almost always painless.

Treatment.—Two or three methods; one, little used at present, by seton, allowing the fluid to escape gradually along the side of the thread until by infection an inflammatory process has been set up. Another method is by excision of a portion of the cyst wall. This has been done with scissors, snipping the membrane by thrusting one blade into the tumor and cutting out a triangular section; as soon as the fluid escapes, the tincture of iodid is injected. This is the treatment commonly pursued, and is usually followed by no return of the tumor. Occasionally the retained saliva becomes inspissated, and the tumor requires extirpation.

Labial cysts of the vulva are found in the ducts of Bartholin's glands and the mucous ducts proper. The latter are frequently seen in aggravated cases of gonorrheal infection, which causes duct closure and consequent swelling. When large they should be evacuated by free incision.

WEN—SEBACEOUS CYST.

The next form of retention tumor—the **wen**—simply refers to the collection of sebaceous material by the closure of a sebaceous duct. It is sometimes called

atheromatous cyst from the gruel-like consistency of the contents, but this is far away from the real contents; the term is improper and should be discarded. They may be single, or occur in groups, and may follow where there has been any outside irritation. I have seen several cases where it seemed as if the pressure of a hat obstructed the sebaceous ducts, and a wen formed directly under the hat-band. They are usually painless, however, and only annoying on account of their size and the occasional interference with wearing the head covering, but they may occur on any part of the scalp or hairy parts of the skin. They sometimes become infected when the skin is abraded, and then suppuration follows; old wens on the scalp sometimes take this course. Treatment is quite simple—that is, the removal of the cystic tumor. On cutting down through the scalp they are seen as white, shining tumors, easily enucleated from the surrounding tissue, and may be removed by the fingers or scalpel handle without difficulty, but all portions of the cyst wall must be removed. The operation is followed by little hemorrhage.

OVARIAN CYSTS.

The ovarian cyst, as a general thing, originates in the Graafian follicles, although there may be other points of origin. The wall is composed of a very tough, dense, fibrous structure, due to the dilatation and growth of the cyst wall—the proper tunic or sac of the ovary. Now,

this tumor differs from ovarian dropsy very materially, because the latter was originally an inflammation of the membrane. This, on the contrary, is a cystic degeneration of the follicle. When the cyst is associated with

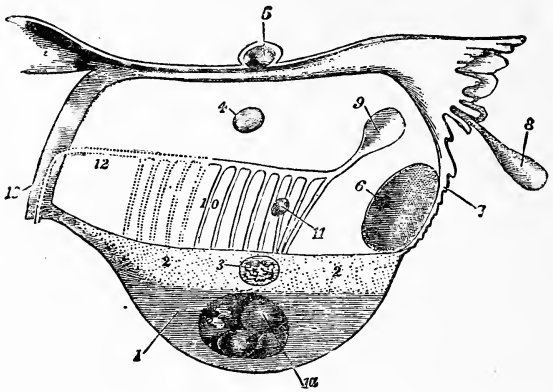

Fig. 19.—Schema of Tubo-ovarian Apparatus, to show the Various Points of Origin of Cystic Growths.—(*After Doran.*)

1*a*. Multilocular glandular cyst, developed in, 1, ovarian parenchyma. 3. Papillary cyst, developed in, 2, tissue of the hilum of the ovary. 4. Unilocular cyst of the broad ligament, from the parovarium, 10. 5. Unilocular cyst of the broad ligament, situated just above the Fallopian tube, but not united to it. 6. Similar cyst near, 7, utero-ovarian ligament. 8. Hydatid of Morgagni, which is never the starting-point of a large cyst. 9. Cyst developed at the expense of the horizontal canal of the parovarium. 11. Cyst developed at the expense of the vertical tube (*according to Doran,* these are the papillary cysts of the broad ligament). 12, 13. Course of the obliterated canal of Gärtner; papillary cysts may be developed at any portion of this canal (*Coblenz*), and these cysts may be the origin of papillary cysts connected with the uterus, 13.

hydrosalpinx the tube may become greatly distended, and is then known as tubo-ovarian cyst.

Diagnosis.—It was formerly taught that the fluid of these cysts, which, as you know, is highly albuminous,

could be diagnosticated by the ovarian cell of Drysdale, but nobody now thinks of making that a test.

Ovarian cysts generally originate before puberty. Virchow relates the case of a child ten years of age in which the cyst was fully formed. Fecal accumulation may be mistaken for an ovarian tumor. It is not very uncommon for young women to allow great accumulations in their rectums. It is inconvenient to go to the closet; by long habit they become perfectly unconcerned as to results, and finally there is a disinclination to go to stool more than two or three times a week. The means of making the diagnosis between ovarian tumor and fecal accumulations will be: knowledge of the history of the case; by percussion of the abdomen; examination by passing two fingers inside the vagina and conjoined manipulation of the abdomen will detect the swelling in the bowel caused by the fecal accumulation. A more common affection, known as pregnancy, has been mistaken for tumor. Of course, you will understand that the general signs of pregnancy will be almost entirely absent in the case of ovarian cyst, except that of suppression of the menses. Fibromuscular tumors of the uterus may be mistaken for ovarian tumors. In uterine tumors, except fibroids, there is but little change in the menstrual flow. In ovarian tumors the flow usually ceases; not always, however, for, if one ovary remains healthy, the menses are affected in a less degree and only entirely ceases when the cyst becomes very large. Ordinary dropsy is sometimes difficult to diagnose from

large ovarian tumor. If the patient be placed on the back in ordinary dropsy, there will be a general flattening of the tumor, owing to the fluid passing into all parts of the cavity; whereas, in ovarian tumor there is less flattening, because the tumor is firmly held by its sac, and does not flatten by the weight of its own contents, as a dropsical accumulation would. Then the history of the case gives pretty conclusive evidence of its nature. You will remember in the one case there had been pain in one or other of the iliac fossæ. The growth was slow and the health not generally affected, while in ascites there is little pain, and almost always impairment of the health. The ovarian cells, so-called, have not been found so constant as the discoverers claimed they would be in the beginning, so that the microscopic examination of the fluid is not looked upon as a positive diagnosis. Absence of albumen is said to be another diagnostic point, but this also is fallacious, because you will find that the ascitic fluid is also albuminous. Hydatid tumors of the uterus—cystic tumors due to parasites, the echinococcus, etc.; these are also to be differentiated. It is found, on investigation of the history of the case, that when the hydatid originated there were some uterine disorders, with pain referred almost entirely to the uterus, and swelling referred almost entirely to the median line. I might mention that upon microscopic investigation of the fluid, which can be obtained by means of an aspirator or hypodermatic syringe, you may see the parasite under the

microscope. Hematometra, which is an accumulation of menstrual blood from an imperforate hymen or from closure of the cervix, might possibly be confused with uterine hydatids in diagnosis. There is still another disorder liable to be mistaken for uterine or ovarian tumor — spurious or phantom pregnancy. This frequently occurs in married ladies past thirty years of age, and more frequently in those who have a great desire to have children. There will be observed the same swelling of the abdomen, frequently quite tense. It may be diagnosticated from tumor by giving an anesthetic, when the tumor will disappear in spurious pregnancy, and the abdomen immediately flatten. The percussion note is quite different in a fluid from a solid tumor, and by percussion its outlines may be mapped out. Then, if the wall of the cyst be not very tense, you can get fluctuation. Sometimes in multilocular tumors, and those with thick walls, there will be very little fluctuation, if any. By percussion, however, we may accurately locate the situation of the intestines and judge of the actual size of the tumor. In case of doubt we may inflate the intestines by a rectal tube attached to an air bag, when the percussion note will more clearly outline the area of dullness.

Treatment.—Instances of spontaneous recovery have been reported, but they have usually been preceded by violent rupture of the ovarian cyst, setting up inflammation, suppuration, etc. Tapping was once the first operation resorted to, and several cases have been cured by

that simple process, but now is seldom made use of. There may be many cases where, from advanced age or feebleness of the patient, the radical operation is contra-indicated and tapping must be resorted to as a palliative measure. I saw such a case in consultation with Dr. Chamberlin, of Washington. The patient, seventy-seven years of age and very feeble, was tapped, and about five gallons of melanotic albuminous fluid drawn out. After six months had elapsed the tumor had not refilled. About a gallon of fluid was removed in May, 1891.

Incisions have been practised and injections of iodin given. Peasley announced that the unilocular cyst was the only form that should be subject to incision. Galvanopuncture is also used; and finally the method most commonly used, that of total extirpation,—the operation of ovariotomy by removal of the tumor.

There is another cyst, known as **parovarian cyst,** which originates in the Wolffian bodies which form the parovarium. Its symptoms, diagnosis, and treatment do not differ materially from those of the ovarian cyst proper, so I shall not go into its minute description. Professor Thomas relates a case of cyst of the broad ligaments, under which name the parovarian cyst is more commonly described, in which ovariotomy was performed and both ovaries found entirely normal; so you will see that it is possible for the parovarian cyst to develop to a considerable size without any disease of the ovaries.

Entire removal is probably the only treatment prac-

ticable. Some expert microscopists claim that the difference in the contained fluids is very considerable, that of the broad ligament approaching more nearly the ascitic fluid found in dropsy.

BURSAL CYSTS.

These are formed in the bursæ.

First is the **hygroma**, which is the common watery tumor sometimes called a barren cyst, or watery cyst. Sometimes they are called cysts of dilatation (that is, a cyst contained in a preëxisting space), in order to distinguish them from the cyst proper, which is due to retention. A cyst from dilatation means a cyst formed by dilatation from an inflammatory process of the sac wall, and an actual increase in the natural fluid produced, so that it does not appropriately come under the term "cyst," though ordinarily speaking we could call it such. Hygroma proper is, therefore, different from a diseased bursa. Those cysts that are found along the fascia lata are of this variety.

A *proliferating hygroma* is an abnormal structure from the beginning. The contents of the bursa are constantly augmenting. The wall of the membrane puts out papillary granulations which continue to proliferate and grow. They are sometimes traversed by bands of connective tissue which subdivide them, and they are then called multilocular. Housemaid's knee is one of the most common varieties. The origin of housemaid's knee is very

doubtful. If this old skeleton, hanging in our lecture room, were a recent subject instead of a dried-up old veteran, we would see that the weight of that knee when in the kneeling posture rested upon the condyles of the femur and the head of the tibia, and not upon the patella. The patella is entirely out of harm's way, so that it is very doubtful if housemaid's knee is caused by working in that position. But the irritation of the quadriceps tendon may produce it. If kneeling were the constant cause, carpet-layers would have it. I have seen the disease in carpet-layers, but they are not specially predisposed to housemaid's knee. In those cases the origin is undoubtedly traumatic. The diagnosis is easily established. Upon pressing the patella from side to side the tumor moves with it. In enlargement of the joint you must remember that the synovial sac extends two or three inches above the patella, so that if you were to press it at the side and above the patella you would find fluctuation. In housemaid's knee there is no distinct fluctuation behind the patella from side to side above the upper border. All fluctuation that you can obtain is from before backward—prepatellar. Then the configuration of the tumor in case of housemaid's knee is conic. It projects directly in front of the patella.

The treatment of this affection may be external, or you may be able to produce absorption by the internal use of iodid of potassium and the external application of iodin. It is well to try that in the beginning, but usually you must not expect to cure your patients by such

means. You may finally cure them, for in the majority of cases the treatment will be that of making a free incision into the tumor and evacuating its contents, or by a trocar and cannula and the injection of tincture of iodin. Very frequently you will find the contents consist of thick fluid. In that case the use of the trocar will be impracticable, but a free incision might be made directly into the swelling, or you might inject iodin, passing it freely around into the structure. If the sac is multilocular, great care will have to be taken to reach all parts of the structure. It must be almost completely extirpated, or the disease will recur.

Dropsy of the bursæ mucosæ is an increase in the natural fluids of the part. They are usually chronic and pendulous. They do not give the patient any uneasiness or pain, but they are in the way. Proliferating hygroma of bursæ mucosæ may sometimes coexist with sarcomatous growths, and it is very doubtful whether they do not belong more properly to sarcoma proper. When coexistent with a sarcomatous growth, they partake of its nature. The treatment of uncomplicated dropsy of bursa is by free incision; and if there is great hemorrhage from the tumor it should be treated with the thermocautery.

GANGLION.—Last is the so-called **ganglion,** which is a simple abnormal swelling caused by an exudation or increase in the synovial fluid. The word ganglion is a misnomer as applied to these tumors. The term has not the slightest significance as to the nature of the tumors, but

they are called ganglions. I think I can give you a little diagram here which will show you the nature of this ganglion. We will say that this broad line is a tendon,

the sheath of the tendon lying just above it. Now, you will observe that this sheath has been pushed up. It is simply a protrusion above the tendon. The sheath is not ruptured; it simply protrudes and raises the skin. The contents of this ganglion do not differ from the natural contents of the sheath, except in amount. They most commonly appear on the tendons on the dorsum of the hand, but I have had under treatment a case where the ganglion was situated underneath the flexor tendon of the index-finger, under the palmar fascia. The treatment is almost the same as in the other varieties of hygroma. You may lay them open, but the quickest and easiest way is to take a book and break them by a sharp blow. The forcible rupture of the ganglion will cause it to disappear; placing a bandage on it with moderate pressure will be sufficient. I saw one at Providence Hospital I was unable to rupture by the hardest stroke. It seemed to be multilocular. Failing to rupture it in the usual way, I made an incision entirely through the tumor down to the tendon, and laid in a pledget of lint saturated with bichlorid of mercury solution, after having first injected tincture of iodin, pressing it about so that the iodin penetrated every portion of the tumor sac.

The man made a good recovery. We call the thick inspissated fluid melicera, or "honey wax." When the ganglion occurs in the palm you will be unable to rupture it by a blow; incision and injection will be required. In certain cases of *diffuse ganglion* the whole dorsum of the hand may be affected and dissection of the posterior portion of the sac will be required. Injections will be found useless, and the tumor is too broad to be ruptured.

SEROUS CYSTS.

These are the lymphatic cysts, which present to the eye the appearance of vesicles containing lymph. They are dilated lymphatic vessels which have become occluded and lost their connection with the lymphatic system. They may be mistaken for branchial cysts.

CYSTS IN WHICH THE FLUID IS CONTAINED IN A SPACE OF NEW FORMATION.

BLOOD CYSTS.

These are caused by hemorrhage into spaces produced by degenerative changes. Zeigler thus explains: After a cortical hemorrhage in which the greater part of the blood spreads along beneath the pia mater and penetrates into the pial and subarachnoid meshes, should the arach-

noid be torn the blood passes into the subdural space. "Presently disintegration of the effused blood and of the damaged cerebral matter takes place, and the products of disintegration are, in the course of time, almost entirely absorbed by the action of fat-granule and pigment-granule cells. The space thus left unoccupied is filled up either by the accumulation of liquid or by the collapse and concentration of the brain substance. In the latter case a corresponding dilatation of the subarachnoid space or of the ventricles must occur. When part of the space is filled up with liquid the result is an *apoplectic cyst.*"

DEGENERATION CYSTS.

These are found in the brain and in tumors principally. "Subarachnoid and pial spaces that are shut off from the surrounding tissue are sometimes distended with liquid and give rise to subarachnoid and pial cysts. . . . The choroid plexuses of the ventricles, on the other hand, are apt to undergo cystic degeneration and then enclose a varying number of cysts from the size of a pea to that of a bean or, seldom, larger. The cyst wall consists of vascular connective tissue, covered externally with polygonal epithelium and internally with an endothelial lining membrane. The interior of the cyst is sometimes traversed by fibrous trabeculæ and vessels" (Zeigler).

CYSTS IN TUMORS.

These are the result of degenerative changes. The cyst contents may consist of oil, as in lipomata; serum, mucus, colloid, cholesterin, or blood, according to the anatomic character of the tumor and its seat. These cysts are very common in myomata of the uterus, where they form spaces containing a mucoid fluid between the bundles of muscle-fiber. They have no proper cyst wall, and in strict adherence to the definition of the term cyst, they are not properly classed.

CYSTS OF CONGENITAL ORIGIN.

Dermoid Cysts.—The inclusion theory formerly held of the origin of these cysts, so far as the ovary is concerned, is no longer tenable in the light of recent researches in embryology and parthenogenesis. The dermoid cysts were conclusively shown by Henneguy, in 1894, to be developed by parthenogenesis; that is to say, instead of considering the dermoid cysts of the ovary as the included remains of a twin fetus, we are to consider it as an example of fetal segmentation by parthenogenesis, and that dermoids elsewhere are either epithelial inclusions or enclavements. Thus there are three ways in which these cysts are produced: (1) The ovarian dermoid cyst, by parthenogenesis; (2) the deep dermoid cysts of the abdomen and scrotum, by fetal inclusion (diplogenesis); (3) dermoid cysts in which the

contents consist of the same kind of dermal appendages as are found at the site of the growth, by enclavement (infolding) (Duval). In support of this last proposition Duval points out that the hair found in dermoids of the eyebrow is the same as that of the region; that in the congenital dermoids of the fingers there is neither hair nor sebaceous glands; and those rarer forms in which teeth are developed, excepting those of the ovary, are always developed in the maxillary region, where the dental germ is found naturally.

Macroscopic Appearances.—These cysts may contain sebum, the cells of epidermis,—that is, pavement epithelium,—and the walls of the cyst are usually like true skin. Sometimes these tumors contain hairs, sweat-glands, teeth, etc., and the products of these glands are retained in the cysts, and add to their size and keep the growths constantly increasing. The hair found in ovarian dermoids is sometimes very long and in great bunches. This is produced by the hair-follicles found in the cyst wall. Teeth are sometimes found in them, encased in bone. Sometimes the teeth are loosely floating in the waxy substance. Hair has also been found in the globe of the eye, in the testicle, in the mouth, the pelvis, the scrotum, cysts of the eye-brow, the fingers, and, occasionally, in the branchial clefts.

BRANCHIAL CYSTS.

These cysts are formed in the branchial clefts, and the contents are variable. If you will discard the terms epiblastic, mesoblastic, and hypoblastic, as pertaining to the ectoderm (skin), mesoderm (connective tissue), and entoderm (mucous membrane), and think of these layers by the names as you ordinarily know them, they will be easier to remember. Mucous, dermoid, serous, and hemorrhagic cysts are the varieties found in the branchial clefts. The explanation already given when speaking of dermoid cysts will enable you to understand why dermoids of the branchial clefts do not contain long hair, but only sebum, hence are frequently but erroneously called atheromatous (sebaceous) cysts.

These cysts are very obstinate in respect to treatment, and a partial removal is invariably followed by branchial fistula. This is very annoying to the patient and difficult to cure. The injection of tincture of iodin has been highly extolled, but in most cases it will be found necessary to extirpate the cyst and the cyst wall. When strongly attached to the veins it may be necessary to sacrifice the portion of the vein so attached; where the surface of the cyst can not be fairly removed from the floor of the cleft the actual cautery should be used.

PARASITIC CYSTS.

These are formed in consequence of the presence of echinococcus, cysticercus, etc., and are found in all parts

of the body, frequently in the liver, kidney, and brain. A case occurred in the Marine Hospital at Detroit, Mich., November 23, 1882, as reported by the late Surgeon W. H. Long.

W. G. T., captain of schooner "S. H. Lathrop"; age, fifty years; nativity, New York; was admitted to the United States Marine Hospital at Detroit, Mich., November 23, 1882, suffering from hemiplegia of right side and marked aphasia.

History.—The patient was corpulent and weighed about 225 pounds. He was brought to the hospital a few hours after the onset of the attack, which was ushered in by a severe convulsion and all primary symptoms of apoplexy. The patient sank rapidly, and died comatose on the following day, November 24th.

Necropsy.—When the skull-cap was removed, the meninges were found very much congested, a large quantity of fluid in the subarachnoid space, and connective tissue on surface of brain. The brain was removed, and weighed sixty-three ounces (a fraction over 2000 grams). A careful examination was made to discover an extravasation or ruptured artery, but none was found. The brain tissue was congested, and surface of cerebellum infiltrated, but the ventricles contained only a trace of fluid. In each lateral ventricle, however, there was found a pedunculated polycystic body, of an elongated and ovoid shape, about two inches in length (figure natural size), and free from any attachment, except to choroid plexus. They were lying loose on the floor of each ventricle, and connected with one end was a long stem (pedicle), which sprang from within a large capillary given off from the choroid plexus—the attachment above mentioned. These

polycysts were composed of a large number of cysts of varying size, and examination by the microscope showed them as containing a large number of small, round bodies on the inner surface of the cyst walls; they are of different structure from the cysts, as shown by their polarizing, while the cyst walls do not. It is believed they were echinococci. While "hydatid" tumors containing echinococci are commonly single in the brain, they not infrequently occur in groups, each group having its pedicle, as shown in this specimen.

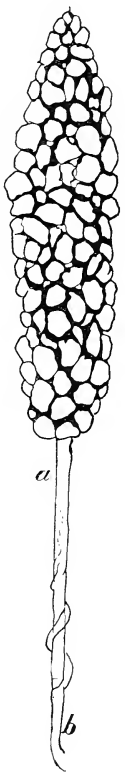

FIG. 20.—*a*. Stem, terminating in *b*, a capillary attached to choroid plexus.

ECHINOCOCCI.

I have reported in the "Journal of the American Medical Association," October 7, 1893, an interesting case of hydatids of the kidney, which was successfully operated upon by me in the Rush Medical College Clinic. The diagnosis was made by finding capsules of the cysts and hooklets in the urine. I made a transverse incision parallel with the last rib, exposed the kidney, packed the perinephritic space with iodoform gauze, then incised the kidney from behind forward, carrying the incision into the pelvis. The fluid contents of the cyst escaped through the wound, and daughter cysts,

round, white, and shining, rolled out of the incision in great numbers. Irrigation was then practised, and the parent cyst having been entirely emptied of its contents,

Fig. 21.—Yaws (Frambesia).

was flushed with iodin water, and the wound packed to the bottom with iodoform gauze. The patient was comfortable after the operation, progressed toward a rapid convalescence, and was well in four weeks.

YAWS.

Yaws, also called frambesia, is a disease of the West Indies and tropic islands, and endemic in the mountains of Peru. It is also known as Peruvian *verruga*. The disease has a febrile stage and an eruptive stage. When the eruption appears, the tumor grows until it attains the size of a raspberry; some remain about the size of a currant. The accompanying illustration from Dr. Nielly's "Éléments de Pathologie Exotique" shows very clearly the appearance of these growths. Yaws also forms in the cutaneous folds, in the wrinkles of the neck, axilla, groin, and in those places in which condylomata appear. It first occurs in small, reddish spots, which are hemorrhagic; they enlarge and finally ulcerate. The disease is contagious and the exudation from it inoculable. It is, however, amenable to treatment.

Treatment.—In the first place, the tumors should be excised or cauterized, and the febrile symptoms controlled by appropriate medication. In Peru descent from the mountain is insisted upon, and general tonics are administered.

APPENDIX.

I am indebted to my friend, Dr. E. R. LeCount, for the following condensed statement of the methods used in Rush Medical College Laboratory:

Methods of Preservation and Hardening of Tissues for Microscopic Examination Commonly Used for Routine Work in Pathologic Laboratories.

Alcohol.—Small blocks of the tumor, if it be large, are cut out and placed in strong alcohol (ninety-three to ninety-five per cent.), supported near the surface of the fluid by cotton, and kept in tightly corked bottles. These blocks should not be larger than one to two cubic centimeters in size; they are selected from portions of the tumor which seem to differ in structure when examined with the unaided eye. They are placed in separate bottles if they exhibit marked deviations, and a record is made of each portion as to peculiarities in color, consistency, exact location, etc.

It is frequently very desirable to know to what extent invasion of adjacent tissue has taken place; a knowledge may be desired of the exact structure of certain areas which appear necrotic, cartilaginous, or edematous, or of the structure of an apparent capsule. These facts can be readily ascertained by preserving separately and carefully labeling such portions of any given growth. Tumors

larger than an English walnut should never be put entire and without incising into weak alcohol and allowed to remain without a change to stronger alcohol, as is so frequently done.

The more central portions by such treatment become unfit for microscopic examination. Any tumor may be preserved properly as a single mass by making a number of parallel cuts with a sharp knife short distances apart, which extend almost through the growth. This allows penetration of the hardening fluid, secures its gross anatomical characteristics, and permits future selection of certain definite regions for examination. Whenever a large amount of any tissue is to be hardened in alcohol, the alcohol should be changed until dehydration is completed or until the alcohol remains strong (ninety per cent.).

Tissues well fixed at the outset seldom deteriorate, even though the reagent becomes weak afterward.

Müller's Fluid and Formalin.—This mixture is especially indicated for the preservation of large tumors intact, for all vascular new growths; it not only preserves nicely the blood-corpuscles, but coagulates the blood-serum. It is therefore valuable for edematous specimens, angiomata, myxomata, etc. It consists of four parts of the ordinary commercial forty per cent. solution of formaldehyd in 100 parts of Müller's fluid. The quantity used should exceed several times the bulk of the tumor. The fluid should be changed as often as it becomes cloudy. Large tumors are well hardened at the end of two or three weeks. They may be kept in the solution indefinitely, but it is best to wash out the hardening fluid and transfer to alcohol. The washing is done in running water. When, after allowing the tumor to stand in still water, equal in amount to the size of the tumor, for twenty-four

hours, it colors the water but slightly, it may be transferred to alcohol. The alcohol should be changed at the end of twenty-four hours.

Zenker's Fluid:

Bichromate of potassium,	2.5
Sulphate of sodium,	1.0
Corrosive sublimate,	5.0
Glacial acetic acid,	5.0
Water, to make,	100.0.

Small portions of the tumor, selected from suitable localities, are allowed to remain in this reagent at the most one hour. The pieces should not be larger than five to ten cubic millimeters in size. They are then washed for from six to twelve hours in running water. For this purpose bottles provided with a cork perforated with two small glass tubes, one of which is to be connected to the tap, will be found convenient. After washing, the small blocks are transferred to alcohol (sixty to seventy per cent.) which has been tinted to a deep sherry-wine color by tincture of iodin. The object of this treatment is to remove all traces of the mercury. The tincture should be made with pure iodin and alcohol, in order to avoid the potassium iodid so commonly present in the commercial article. This impurity produces a precipitate of mercury which is very hard to remove, makes the sectioning difficult, and obscures the histologic details. As the alcohol becomes decolorized add more of the tincture of iodin, until the color no longer fades. This is completed at the end of some days or weeks, depending upon the size of the blocks, the thoroughness of the washing, etc. When decolorization of the alcohol no longer takes place, transfer to strong alcohol.

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